

Calculus I Maple T.A. Course Module
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This course module has been designed to accompany the first semester honours calculus course at the University of Guelph. At Guelph, we have a twelve week semester, with three fifty minute classes and a fifty minute lab each week.

This is a theoretical course intended primarily for students who need or expect to pursue further studies in mathematics, physics, chemistry, engineering, or computer science. These materials have been successfully used with classes ranging in size from 12 to 600 students.

Topics:

- trigonometry including the compound angle formulas
- inequalities and absolute values
- limits and continuity using rigorous definitions
- the derivative and various applications
- Rolle's Theorem and the Mean Value Theorem for derivatives
- the differential
- anti-differentiation
- the definite integral with application to area problems
- the Fundamental Theorem of Calculus
- logarithmic, exponential functions
- the Mean Value Theorem for Integrals

The course module consists of 11 question banks and 11 assignments, designed to be used weekly, beginning in week 2. Almost all questions are algorithmically generated, with algorithmically generated solutions provided in the question feedback. Over half are Maple graded. Many are created using a multi-part format (for example, Riemann sums). This enables online questions where students produce all the steps they would produce in a full written solution on a midterm or final!

The tests are presented both as 'practice' and as 'homework'. Students are encouraged to do practice tests first, where we have configured the tests so that they can check their answers as they proceed. In the Guelph course, the students are allowed five attempts at the homework quiz, with only their best mark counting towards their final grade. Each is weighted out of 2%. While the students do treat these as tests, they really constitute 'enforced homework'.

The module was first implemented in the Fall, 2007 semester and has been used every Fall semester since. Each time, 500 or more students accessed the tests. After a few coding adjustments in 2007, the tests have run very smoothly. Incidents where a student insists T.A.

graded a question incorrectly are rare. In each such case, so far, the student has been in error. The tests are robust.

Following this introduction, you will find:

- a table of contents for the 11 tests
- a T.A. Protocol Sheet
- a T.A. Syntax Sheet (We strongly recommend that the students use text rather than equation editor entry for their answers.)

This course module is copyright Gord Clement, Jack Weiner and Maplesoft. However, you are welcome to modify and implement the course module at your institution. We encourage you to send us your suggestions for improvements and/or new questions. If we incorporate any of the latter, your contribution will be gratefully acknowledged!

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Calculus I Maple TA Tests

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TA PROTOCOL

PLEASE FOLLOW THIS TA PROTOCOL!

1) Work through the sample TA test in your course manual.

2) Do a couple of "Practice" tests. Use "How did I do?" to check your answers on the go. Use "Preview" to check your syntax.

Note: Preview does not recognize interval notation. So don't use preview to check questions requiring an interval.

Hint: If the answer involves "complicated" math, enter it in Maple, then copy and paste this into TA. TA will translate your answer into correct syntax. Neat. Please don't abuse this suggestion by getting Maple to DO the questions for you. By all means, use Maple to check your answers.

3) Now you are ready for prime time. You should be able to get perfect on a "Homework" quiz in one or two attempts. **You will allowed FIVE attempts.** Only your BEST mark will count on TA.

4) DO NOT LEAVE TA TILL THE LAST DAY THE QUIZ IS OPEN!

5) **ALWAYS GRADE YOUR TEST WHEN YOU ARE FINISHED.** If you didn't do all questions when you grade, TA will inform you. Then you MUST click grade again. If you click, "View Details", you will see your entire test and be given the option of printing it.

6) Always **"QUIT AND SAVE"** after you finish a test whether it is homework or practice.

All your homework tests are saved in the system and you can retrieve and view them at any time.

Unless indicated otherwise in class, do NOT switch math entry mode to symbolic math. Continue to use text entry.

Always include arithmetic operations. For example, don't enter xy when you mean $x*y$. (TA and Maple will treat xy as a single symbol.) Use brackets generously but only "(" and ")" unless otherwise specified in the instructions to a question. Please pay attention to those extra instructions when they are included.

TA SYNTAX

(Keep this sheet with you whenever you work on at TA test.)

Math Expression

TA text entry syntax

$$x \cdot y; \quad \frac{x}{y}$$

$$x*y; \quad x/y$$

$$x^y$$

$$x^y$$

$$\frac{a}{b \cdot c}$$

$$a/(b*c) \text{ or TA likes } a/b/c \text{ (but I don't)}$$

$$\sqrt{x}$$

$$\text{sqrt}(x) \text{ or } x^{(1/2)} \quad \text{Do not use } x^{.5}!$$

$$x^{\frac{2}{3}} = \sqrt[3]{x^2}$$

$$x^{(2/3)}$$

$$|x|$$

$$\text{abs}(x)$$

$$\ln(x); \log_2(x)$$

$$\ln(x); \log[2](x)$$

$$e^x; e; \pi; \infty$$

$$\text{exp}(x); e \text{ or } \text{exp}(1); \text{pi} \text{ or } \text{Pi}; \text{infinity}$$

$$\sin^2(x) = (\sin(x))^2$$

$$\sin(x)^2 \text{ or } (\sin(x))^2$$

TA always uses $1 + \tan(x)^2$ for $\sec(x)^2$ but $\sec(x)^2$ is fine.

TA always uses $1 + \cot(x)^2$ for $\csc(x)^2$ but $\csc(x)^2$ is fine.

TA always uses $\sin(x)/\cos(x)^2$ for $\sec(x)*\tan(x)$ but $\sec(x)*\tan(x)$ is fine.

TA always uses $\cos(x)/\sin(x)^2$ for $\csc(x)*\cot(x)$ but $\csc(x)*\cot(x)$ is fine.

Test 1: Trigonometry Review

Question 1: Score 1/1

Convert -315° to radian measure. (Your answer should be exact. Enter Pi for π .)



Correct

Your Answer: $-7/4*\text{Pi}$

Correct Answer: $-7/4*\text{Pi}$

Comment: Multiply the degree measure by $\frac{\pi}{180}$.

Question 2: Score 1/1

Convert 27° to radian measure. Round your answer to two decimal places.



Correct

Your Answer: .4712

Correct Answer: .4712389

Comment: Multiply the degree measure by $\frac{\pi}{180}$.

Question 3: Score 1/1

Convert the radian measure $\frac{1}{3}\pi$ to degrees. (Omit the degree symbol in your answer.)



Correct

Your Answer: 60

Correct Answer: 60

Comment: Multiply the radian measure by $\frac{180}{\pi}$.

Question 4: Score 1/1

Convert the radian measure 3.7 to degrees. Round your answer to two decimal places. (Omit the degree symbol in your answer.)



Correct

Your Answer: 211.994384

Correct Answer: 211.994384

Comment: Multiply the radian measure by $\frac{180}{\pi}$.

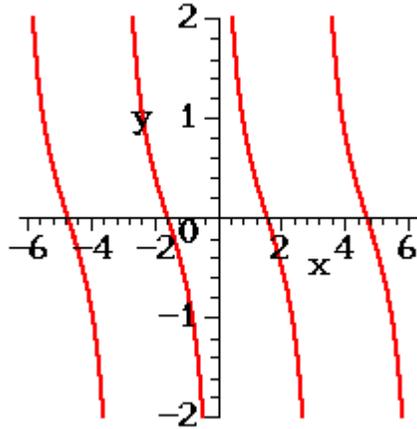
Question 5: Score 1/1

Which of the following is the graph of $y = \cot(x)$?

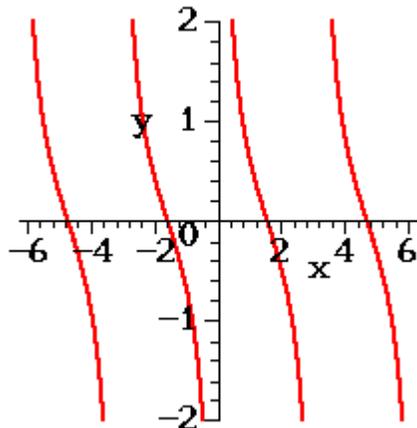


Correct

Your Answer:



Correct Answer:



Comment:

Question 6: Score 1/1

State, **IN RADIANS**, the exact period of the function $\tan(5x)$.



Correct

Your Answer: $1/5 \cdot \pi$

Correct Answer: $1/5 \cdot \pi$

$\tan(5x)$ is the function $\tan(x)$ with a horizontal compression by a factor of $\frac{1}{5}$.

Comment:

Therefore, the period is $\pi \times \frac{1}{5}$.

Question 7: Score 1/1

Find the exact value of $\sin\left(-\frac{7}{4}\pi\right)$. If the answer is not finite, enter U (for undefined!)



Correct

Your Answer: $1/\sqrt{2}$

Correct Answer: $1/2 \cdot 2^{(1/2)}$

Comment:

Question 8: Score 1/1

Find the exact value of $\sec\left(-\frac{11}{6}\pi\right)$. If the answer is not finite, enter U (for undefined!)



Correct

Your Answer: $2/\sqrt{3}$

Correct Answer: $2/3 \cdot 3^{(1/2)}$

Comment:

Question 9: Score 1/1

We know that $\sin(2 \cdot x) = 2 \cdot \sin(x) \cdot \cos(x)$ and $\cos(2x) = \cos^2(x) - \sin^2(x)$. Use the appropriate formula to expand $\cos(12x)$ in terms of one of these two formulas.



Correct

Remember to enter $\sin^2(x)$ as $(\sin(x))^2$ NOT $\sin^2(x)$.

Your Answer: $\cos(6 \cdot x)^2 - \sin(6 \cdot x)^2$

Correct Answer: $\cos(6 \cdot x)^2 - \sin(6 \cdot x)^2$

Comment:

$\sin(2x) = 2 \sin(x)\cos(x)$	$\cos(2x) = \cos^2(x) - \sin^2(x)$
$\sin(2 \cdot (6x)) = 2 \sin(6x)\cos(6x)$	$\cos(2 \cdot (6x)) = \cos^2(6x) - \sin^2(6x)$
$\sin(12x) = 2 \sin(6x)\cos(6x)$	$\cos(12x) = \cos^2(6x) - \sin^2(6x)$

Question 10: Score 1/1

Find the range of the function $y = -\cos(8x) - 4$.



Correct

Note: Use the letter U for union. For ∞ type infinity.

eg: for $(-\infty, 3) \cup [5, \infty)$, you would enter $(-\infty,3) \cup [5,\infty)$.

Your Answer: $[-5, -3]$

Correct Answer: $[-5, -3]$

Comment:

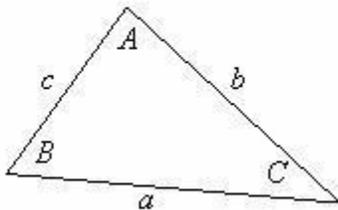
$$-1 \leq \cos(x) \leq 1$$

$$-1 \leq \cos(8x) \leq 1$$

$$-(-1) \geq -1 \cos(8x) \geq -1 \quad (\text{Did the inequality signs change directions?})$$

$$-5 \leq -\cos(8x) - 4 \leq -3$$

Question 11: Score 1/1



Correct

In the triangle (not drawn to scale!), side $a = 3$, side $b = 1$, and in degrees, angle $C = 40^\circ$. Using the Cosine Law, find side c . Round your answer to two decimal places.

Your Answer: 2.324

Correct Answer: 2.32459316

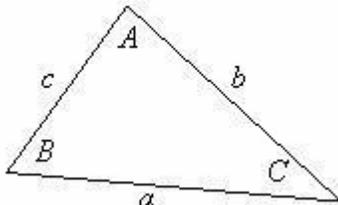
$$c^2 = a^2 + b^2 - 2ab \cos(C)$$

Comment: $c^2 = (3)^2 + (1)^2 - 2(3)(1)\cos(40)$

$$c = 2.324593$$

Make sure your calculator is in 'Degree' mode.

Question 12: Score 1/1



Correct

In the triangle (not drawn to scale!), side $a = 9$, side $b = 9$, and angle $B = 5^\circ$. Using the Sine Law, find angle A . If there is no possible triangle, enter N for none. (This happens when $b < a \cdot \sin(B)$.) If there are two solutions for A (which happens when $a \cdot \sin(B) < b < a$, give the **obtuse angle** (between 90° and 180°) solution. Otherwise (when $b > a$), give the single **acute angle** (between 0° and 90°) solution. Give your answer rounded to two decimal places.

Advance Feedback: The Sin Law is actually really subtle. Go to the Maple Mathematics Survival Kit page on the Sin Law for a neat geometric investigation showing when you get one solution, two solutions, or none at all.

Your Answer: 4.999999840

Correct Answer: 4.999999840

$$\frac{\sin(A)}{a} = \frac{\sin(B)}{b}$$

Comment: $\frac{\sin(A)}{9} = \frac{\sin(5)}{9}$

$$\sin(A) = 0.087156$$

Test 2: Inequalities and Absolute Value

Question 1: Score 1/1

Check the statements that are ALWAYS true.

Choice	Selected	✓/✗	Points
$a \leq b \Rightarrow a^2 \leq b^2$	No		
$a = b \Rightarrow a = b$ or $a = -b$	Yes	✓	+1
$ a \leq b \Leftrightarrow a^2 \leq b^2$	Yes	✓	+1
$a \leq b \Rightarrow a^2 \leq b^2$	No		
$a^2 = b^2 \Rightarrow a = b$	No		
$ a \leq b \Leftrightarrow a^2 \leq b^2$	No		
$ a \leq b \Rightarrow a^2 \leq b^2$	Yes	✓	+1



Correct

Number of available correct choices: 3

[Partial Grading Explained](#)

Comment:

Question 2: Score 1/1

Your response	Correct response
---------------	------------------

What is the best strategy to solve $3x - 5 \leq |7x + 3|$?
You must use cases (100%)

What is the best strategy to solve $3x - 5 \leq |7x + 3|$?
You must use cases



Correct

Comment:

Question 3: Score 1/1

Solve the inequality $4x - 3 < -x + 4$. Give your answer using interval notation and enter infinity for ∞ .

For example, for $[-3, \infty)$ enter [-3,infinity).

Your (-infinity, 7/5)



Correct

Answer:

Correct

Answer:

$$\left(-\infty, \frac{7}{5} \right)$$

Solution:

$$4x - 3 < -x + 4$$

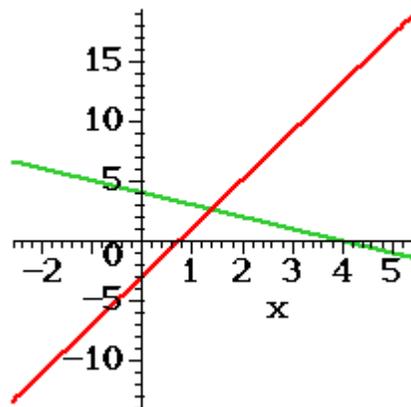
$$5x < 7$$

$$x < \frac{7}{5}$$

Note:

The RED line is $y = 4x - 3$ and the GREEN line is $y = -x + 4$. We want to know in this question when the RED line is UNDER the GREEN line. Look!

Comment:



Question 4: Score 1/1

Solve the inequality $-2x + 1 > 4x - 5$. Give your answer using interval notation and enter infinity for ∞ .

For example, for $[-3, \infty)$ enter [-3,infinity).



Correct

Your

Answer:

(-infinity, 1)

Correct

Answer:

(-infinity, 1)

Solution:

$$-2x + 1 > 4x - 5$$

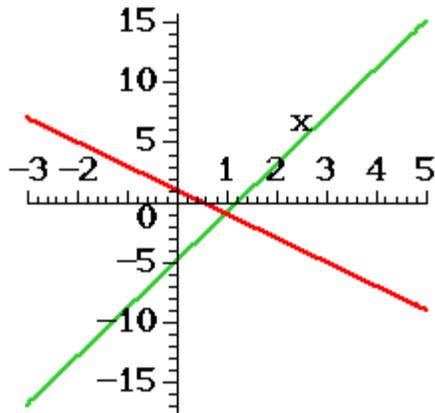
$$-6x > -6$$

Comment:

$$x < 1$$

Note:

The RED line is $y = -2x + 1$ and the GREEN line is $y = 4x - 5$. We want to know in this question when the RED line is ABOVE the GREEN line. Look!



Question 5: Score 1/1

Solve the inequality $0 < -3x - 1 \leq 4$. Give your answer using interval notation.

For example, for $(-\infty, -3) \cup [4, \infty)$ enter (-infinity,-3) U [4,infinity).



Correct

Your Answer: $[-5/3, -1/3)$

Correct Answer: $\left[-\frac{5}{3}, -\frac{1}{3}\right)$

Solution:

$$0 < -3x - 1 \leq 4$$

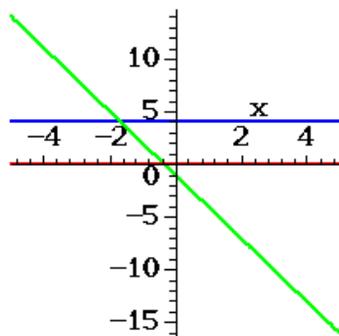
$$1 < -3x \leq 5$$

$$-1/3 > x \geq -5/3$$

Note:

The RED line is $y = 0$ The GREEN line is $y = -3x - 1$. The BLUE line is $y = 4$. Look at where the RED line is UNDER the GREEN line **AND** the GREEN line is UNDER or ON the BLUE line.

Comment:



Question 6: Score 1/1

Solve the inequality $\sqrt[3]{((x+6)^2)}(x-2)(x-7) > 0$. Give your answer using interval notation. Use infinity for ∞ and U for union.

For example, for $(-\infty, -3) \cup [4, \infty)$ enter (-infinity,-3) U [4,infinity).



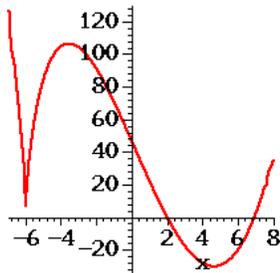
Correct

Your Answer: (-infinity,-6)U(-6,2)U(7,infinity)

Correct Answer: $(-\infty, -6) \cup (-6, 2) \cup (7, \infty)$

Here is the plot of $y = \sqrt[3]{((x+6)^2)}(x-2)(x-7)$. Look at where the graph is ABOVE the x axis!
Note that the x intercepts are **NEVER** part of the solution because the expression is greater than **but not equal** to 0.

Comment:



Question 7: Score 1/1

Solve the inequality $(x+7)^3(x-3)(x-7) \leq 0$. Give your answer using interval notation. Use infinity for ∞ and U for union.

For example, for $(-\infty, -3) \cup [4, \infty)$ enter (-infinity,-3) U [4,infinity).



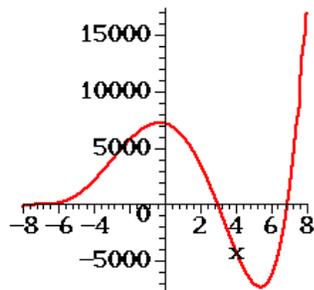
Correct

Your Answer: (-infinity, -7]U[3,7]

Correct Answer: $(-\infty, -7] \cup [3, 7]$

Here is the plot of $y = (x+7)^3(x-3)(x-7)$. Look at where the graph is BELOW OR ON the x axis.

Comment:



Question 8: Score 1/1

Solve the inequality $\frac{\sqrt[3]{(x+5)}(x-7)}{x-3} > 0$. Give your answer using interval notation. Use

infinity for ∞ and U for union.

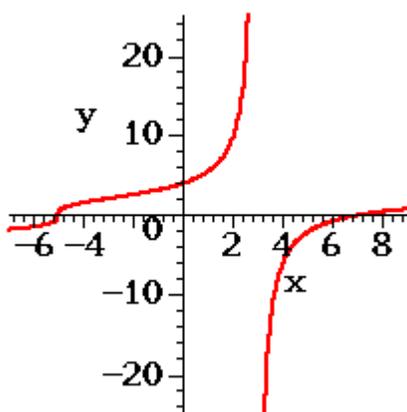
For example, for $(-\infty, -3) \cup [4, \infty)$ enter (-infinity,-3) U [4,infinity).

Your Answer: (-5,3)U(7,infinity)

Correct Answer: (-5, 3) \cup (7, ∞)

Here is the plot of $y = \frac{\sqrt[3]{(x+5)}(x-7)}{x-3}$. Look at where the graph is ABOVE the x axis!

Comment:



Correct

Question 9: Score 1/1

Solve the inequality $\frac{1}{x+4} \leq \frac{1}{2x-2}$. Give your answer using interval notation. Use infinity

for ∞ and U for union.

For example, for $(-\infty, -3) \cup [4, \infty)$ enter (-infinity,-3) U [4,infinity).

Your Answer: (-infinity, -4)U(1,6]

Correct Answer: $(-\infty, -4) \cup (1, 6]$

Comment:

$$\frac{1}{x+4} \leq \frac{1}{2x-2}$$

$$\frac{1}{x+4} - \frac{1}{2x-2} \leq 0$$

$$\frac{x-6}{(x+4)(2x+2)} \leq 0$$

From here perform number line analysis to find the answer.



Correct

Question 10: Score 1/1

Solve the inequality $|x + 5| \leq 3$. Give your answer using interval notation and enter infinity for ∞ and U for union.

For example, for $(-\infty, -3) \cup [4, \infty)$ enter (-infinity,-3) U [4,infinity).



Correct

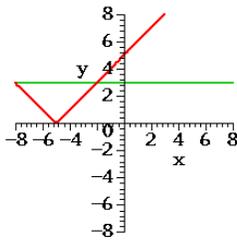
Your Answer: [-8,-2]

Correct Answer: [-8, -2]

$|x + 5|$ measures the distance between x and -5 .

The RED graph is $y = |x + 5|$ and the GREEN line is $y = 3$. We want to know in this question when the absolute value is UNDER or ON the line. Look!

Comment:



Question 11: Score 1/1

Solve the inequality $|x - 3| \geq 5$. Give your answer using interval notation and enter infinity for ∞ and U for union.

For example, for $(-\infty, -3) \cup [4, \infty)$ enter (-infinity,-3) U [4,infinity).



Correct

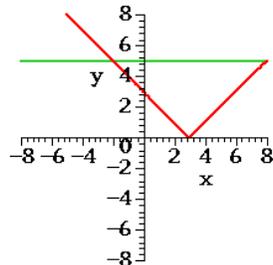
Your Answer: (-infinity, -2)U(8,infinity)

Correct Answer: $(-\infty, -2) \cup (8, \infty)$

$|x - 3|$ measure the distance between x and 3 .

The RED graph is $y = |x - 3|$ and the GREEN line is $y = 5$. We want to know in this question when the absolute value is ABOVE the line. Look!

Comment:



Question 12: Score 1/1

Solve the absolute value inequality $|4x - 2| < -4x - 2$. Give your answer using interval notation and enter infinity for ∞ and U for union if you need it. Enter N if the solution is the null set.

For example, for $(-\infty, -3) \cup [4, \infty)$ enter (-infinity,-3) U [4,infinity).



Correct

Your Answer: N

Correct Answer: N

Solution:

$$\text{Case 1: } 4x + (-2) \geq 0 \Rightarrow x \geq \frac{1}{2}.$$

With the assumption of this case $|4x - 2| = 4x + (-2)$

$$4x + (-2) < -4x + (-2)$$

$$8x < 0$$

$$x < 0$$

Therefore for this case we need $x \geq \frac{1}{2}$ and $x < 0$, which yields no solution.

$$\text{Case 2: } 4x + (-2) < 0 \Rightarrow x < \frac{1}{2}$$

With the assumption of this case, $|4x - 2| = -(4x + (-2))$

$$-(4x + (-2)) < -4x + (-2)$$

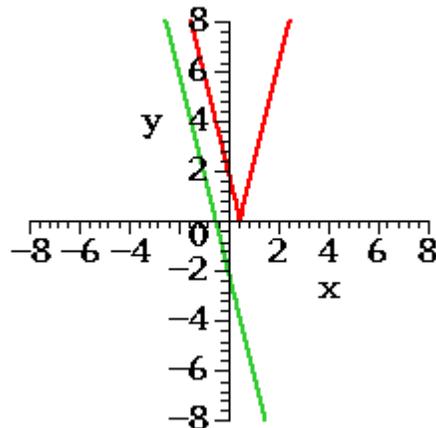
$$0 < -4$$

Comment: Therefore this case yields no solution.

Since both cases gave no solution, the solution is the null set.

Note:

The RED graph is $y = |4x - 2|$ and the GREEN line is $y = -4x - 2$. We want to know in this question when the absolute value is UNDER the line.



Question 13: Score 1/1

Solve the absolute value inequality $|x + 1| < 2x - 4$. Give your answer using interval notation and enter infinity for ∞ and U for union if you need it. Enter N if the solution is the null set.

For example, for $(-\infty, -3) \cup [4, \infty)$ enter (-infinity,-3) U [4,infinity).



Correct

Your Answer: (5, infinity)

Correct Answer: (5, ∞)

Solution:

Case 1: $|x + 1| \geq 0 \Rightarrow x \geq -1$

With the assumption of this case we have $|x + 1| = |x + 1|$.

$$|x + 1| < 2x + (-4)$$

$$-1x < -5$$

$$x > 5$$

Therefore we need $x \geq -1$ and $x > 5$, so this case contributes $x > 5$ to the solution.

Case 2: $|x + 1| < 0 \Rightarrow x < -1$

With the assumption of this case we have $|x + 1| = -(x + 1)$.

$$-(x + 1) < 2x + -4$$

$$-3x < -3$$

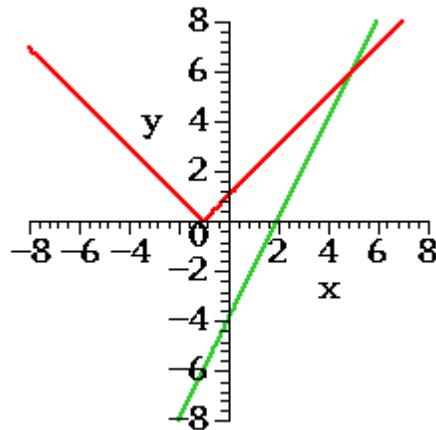
$$x > 1$$

Therefore we need $x < -1$ and $x > 1$, so this case contributes nothing to the solution.

Comment: From Case 1 and Case 2 we see the answer is $x > 5$

Note:

The RED graph is $y = |x + 1|$ and the GREEN line is $y = 2x - 4$. We want to know in this question when the absolute value is UNDER the line.



Question 14: Score 1/1

Solve the absolute value inequality $|x - 5| \leq |2x + 3|$. Give your answer using interval notation.

Enter infinity for ∞ and U for union. Enter N if the solution is the null set.

For example, for $(-\infty, -3) \cup [4, \infty)$ enter (-infinity,-3) U [4,infinity).



Correct

Your Answer: (-infinity, -8]U[2/3, infinity)

Correct Answer: $(-\infty, -8] \cup \left[\frac{2}{3}, \infty\right)$

Solution: There are absolute value bars on both sides of the inequality, the best method is to square both sides.

$$|x - 5| \leq |2x + 3|$$

$$(x + (-5))^2 \leq (2x + (3))^2$$

$$x^2 + (-10)x + 25 \leq 4x^2 + (12)x + 9$$

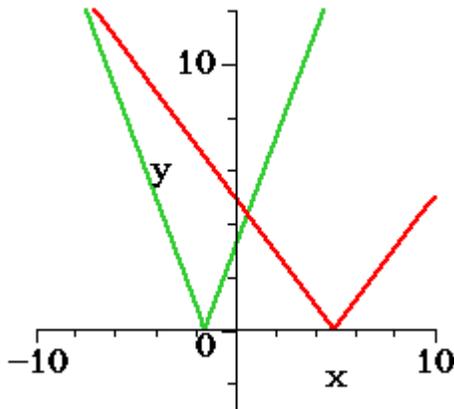
$$3x^2 + (22)x + -16 \geq 0$$

$$(3x + (-2)) \cdot (x + (8)) \geq 0$$

From here, perform a number line analysis to obtain the answer.

Note:

Comment: The RED graph is $y = |x - 5|$ and the GREEN graph is $y = |2x + 3|$. We want to know in this question when the RED absolute value is UNDER or MEETS the GREEN absolute value.



Question 15: Score 1/1

Solve the absolute value inequality $|x - 4| \leq |x + 3|$. Give your answer using interval notation.

Enter infinity for ∞ and U for union. Enter N if the solution is the null set.

For example, for $(-\infty, -3) \cup [4, \infty)$ enter (-infinity,-3) U [4,infinity).



Correct

Your Answer: [1/2,infinity)

Correct Answer: $\left[\frac{1}{2}, \infty\right)$

Solution:

There are absolute value bars on both sides of the inequalities, the best method is to square both sides.

$$|x - 4| \leq |x + 3|$$

$$(x + (-4))^2 \leq (x + (3))^2$$

$$x^2 + (-8)x + 16 \leq x^2 + (6)x + 9$$

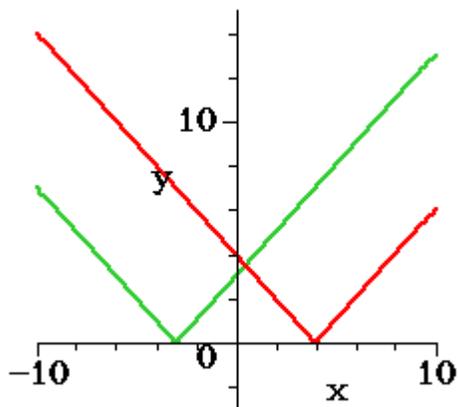
$$(14)x \geq 7$$

$$x \geq 1/2$$

Note:

The RED graph is $y = |x - 4|$ and the GREEN graph is $y = |x + 3|$. We want to know in this question when the RED absolute value is UNDER or MEETS the GREEN absolute value.

Comment:



Test 3: Intuitive Limits

Question 1: Score 1/1

Find $\lim_{x \rightarrow -3} e^{-5x}$.



Correct

Your Answer: e^{15}

Correct Answer: $\exp(15)$

Comment:

Question 2: Score 1/1

Evaluate $\lim_{x \rightarrow 2} \frac{\sqrt{x+34} - 6}{x-2}$



Correct

Your Answer: $1/12$

Correct Answer: $1/12$

Comment: This is a "0/0" limit, here you should multiple the top and bottom by $\sqrt{x+(34)} + (6)$

Question 3: Score 1/1

Evaluate $\lim_{x \rightarrow -1} \frac{x^2 - 3x - 4}{x^2 + 5x + 4}$



Correct

Your Answer: $-5/3$

Correct Answer: $-5/3$

Comment: This is a "0/0" limit, here you should factor. Remember your difference of squares and your sum/difference of cubes formulas.

Question 4: Score 1/1

Evaluate $\lim_{x \rightarrow 9} \frac{x-9}{\sqrt{x}-3}$



Correct

Your Answer: 6

Correct Answer: 6

Comment: This is a "0/0" limit. Use difference of squares to factor $x - 9$ and then cancel.

Question 5: Score 1/1

Find $\lim_{x \rightarrow 0^+} (x - \text{floor}(x))$.

("floor" is the Maple name for $[[x]]$ =greatest integer less than or equal to x .)



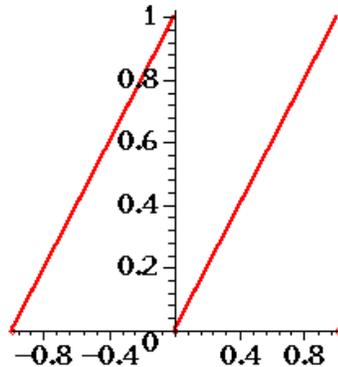
Correct

Your Answer: 0

Correct Answer: 0

Tip: Since we are looking at the limit from the right, try plugging in numbers just bigger than 0, such as 0.1.
Here is a plot of the function

Comment:



Question 6: Score 1/1

Find $\lim_{x \rightarrow -2^-} (x - \text{floor}(x))$.

("floor" is the Maple name for $[[x]]$ =greatest integer less than or equal to x .)



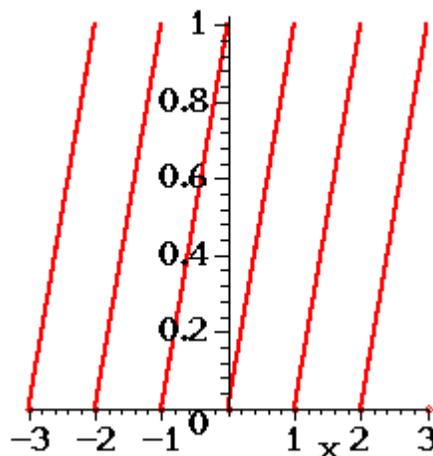
Correct

Your Answer: 1

Correct Answer: 1

Tip: Since we are looking at the limit from the left, try plugging in numbers just smaller than -2, such as -2.1.
Here is a plot of the function.

Comment:



Question 7: Score 1/1

Find $\lim_{x \rightarrow -1} \frac{|x + 1|}{x + 1}$.



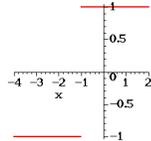
Your Answer: -1

Correct Answer: -1

When $x < -1$, $|x - (-1)| = -(x - (-1))$

Here is a plot of the function

Comment:



Question 8: Score 1/1

Find $\lim_{x \rightarrow \infty} \left(\frac{4x^9 - 3x^2 + \cos(x) - 1}{-x^8 + 3x^3 + 3} \right)$.



Enter infinity, -infinity, a finite number, or N if the limit does not exist.

Your Answer: -infinity

Correct Answer: -infinity

Comment: Divide top and bottom by the highest power of x in the denominator.

Question 9: Score 1/1

Find $\lim_{x \rightarrow -\infty} (\sqrt{x^2 + 4x + 3} + x)$.



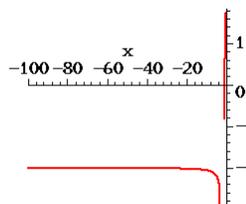
Enter infinity, -infinity, a finite number, or N if the limit does not exist.

Your Answer: -2

Correct Answer: -2

Multiply top and bottom by $\sqrt{x^2 + 4x + 3} - x$, then divide top and bottom by x (the highest power of x in the denominator). Remember when x is negative, $x = -\sqrt{x^2}$.

Comment:



Here is a plot of the function.

Question 10: Score 1/1

Find $\lim_{x \rightarrow -\infty} \left[\frac{-4x^9 - x^2 + \cos(x) - 5}{-x^5 + 4x - 4} \right]$.



Correct

Enter infinity, -infinity, a finite number, or N if the limit does not exist.

Your Answer: infinity

Correct Answer: infinity

Comment: Divide top and bottom by the highest power of x in the denominator.

Question 11: Score 1/1

Find $\lim_{x \rightarrow \infty} \left(\frac{1}{\sqrt{(x^2 - 2x + 3)} - x} \right)$.



Correct

Enter infinity, -infinity, a finite number, or N if the limit does not exist.

Your Answer: -1

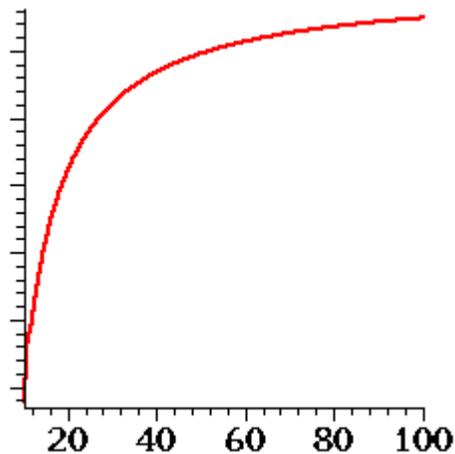
Correct Answer: -1

Answer:

Multiple top and bottom by $\sqrt{x^2 + (-2)x + (3)} + x$, then divide top and bottom by x (the highest power of x in the denominator).

Here is a plot of the function

Comment:



Question 12: Score 1/1

Find $\lim_{x \rightarrow 1^+} \tan\left(\frac{1}{2} \pi x\right)$.

Enter infinity, -infinity, a finite number, or N (for None) if the limit does not exist.

Your Answer: -infinity

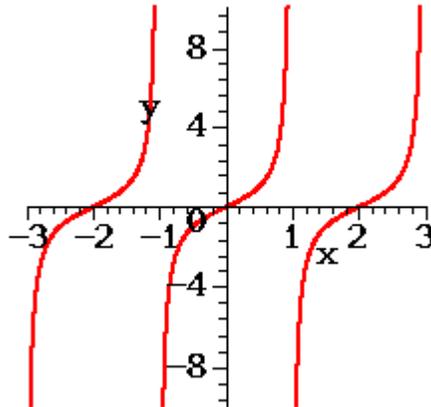
Correct Answer: -infinity

Here is a plot of the function



Correct

Comment:



Question 13: Score 1/1

Find $\lim_{x \rightarrow 0^-} \cot(\pi x)$.

Enter infinity, -infinity, a finite number, or N (for None) if the limit does not exist.

Your Answer: -infinity

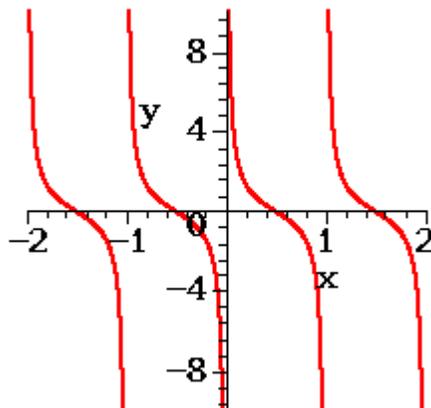
Correct Answer: -infinity

Here is a plot of the function.



Correct

Comment:

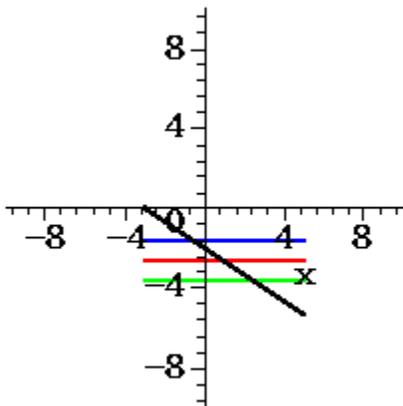


Test 4: Formal Definition of a Limit

Question 1: Score 1/1

$$\lim_{x \rightarrow 1} \left(-\frac{2}{3}x - 2 \right) = -8/3$$

In the plot below, the black line is $y = -\frac{2}{3}x - 2$. The red line is $y = -8/3$. The blue and green lines are respectively $y = -8/3 + \varepsilon$ and $y = -8/3 - \varepsilon$. We want $-8/3 - \varepsilon < y < -8/3 + \varepsilon$.



Correct

In order to PROVE $\lim_{x \rightarrow 1} \left(-\frac{2}{3}x - 2 \right) = -8/3$, we first let $\varepsilon > 0$ and then find the possible choices for δ (ie., delta) so that

$$\text{if } 0 < |x - 1| < \delta \text{ then } \left| -\frac{2}{3}x - 2 - (-8/3) \right| < \varepsilon.$$

The BEST interval of solutions for δ is ...

(Enter epsilon for ε . And don't forget *. Example: for $\frac{3}{2} \cdot \varepsilon$ enter 3/2*epsilon, not 3/2epsilon.)

Your Answer: $(0, 3/2*\text{epsilon}]$

Correct Answer: $\left(0, \frac{3}{2} \varepsilon \right]$

$$\text{We want } |y - -8/3| < \varepsilon$$

$$\Leftrightarrow \left| -\frac{2}{3}x - 2 - -8/3 \right| < \varepsilon$$

Comment:

$$\Leftrightarrow \left| \frac{2}{3}x - \frac{2}{3} \right| < \varepsilon$$

$$\Leftrightarrow \left| -\frac{2}{3} \right| |x-1| < \varepsilon$$

$$\Leftrightarrow |x-1| < \frac{3}{2} \varepsilon$$

Therefore choose δ in $(0, \frac{3}{2} \varepsilon]$

Question 2: Score 1/1

In order to PROVE $\lim_{x \rightarrow 0} (-4) = -4$, we first let $\varepsilon > 0$ and then find the possible choices

for δ (ie., delta) so that

if $0 < |x| < \delta$ then $|-4 - (-4)| < \varepsilon$.

The BEST interval of solutions for δ is ... (Enter epsilon for ε . Enter infinity for ∞ .)

Your Answer: (0, infinity)

Correct Answer: (0, ∞)

Comment: When the function is constant, any δ works!



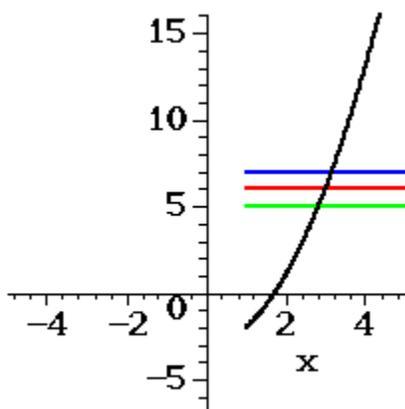
Correct

Question 3: Score 1/1

$$\lim_{x \rightarrow 3} (x^2 - 3) = 6$$

In the plot below, the parabola (the black curve) is $y = x^2 - 3$. The red line is $y = 6$. The blue and green lines respectively are

$y = 6 + \varepsilon$ and $y = 6 - \varepsilon$. We want $6 - \varepsilon < y < 6 + \varepsilon$.



Correct

In proving $\lim_{x \rightarrow 3} (x^2 - 3) = 6$, we let $\varepsilon > 0$. In order to find δ , we will need

a **CONSTRAINT** on $|x - 3|$. If we assume $|x - 3| < 1$, the BEST interval of solutions for δ is .

..
Your Answer: $\left(0, \min\left\{1, \frac{\varepsilon}{7}\right\}\right]$

Correct Answer: $\left(0, \min\left\{1, \frac{\varepsilon}{7}\right\}\right]$

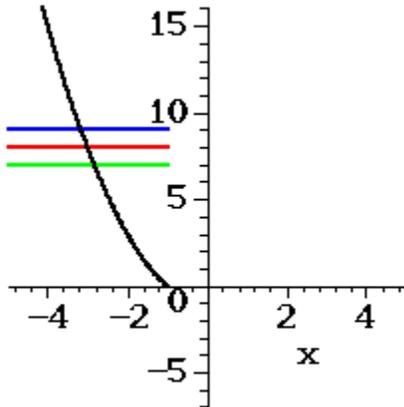
Comment:

Question 4: Score 1/1

$$\lim_{x \rightarrow -3} (x^2 - 1) = 8$$

In the plot below, the parabola (the black curve) is $y = x^2 - 1$. The red line is $y = 8$. The blue and green lines respectively are

$y = \delta + \varepsilon$ and $y = \delta - \varepsilon$. We want $\delta - \varepsilon < y < \delta + \varepsilon$.



Correct

In proving $\lim_{x \rightarrow -3} (x^2 - 1) = 8$, we let $\varepsilon > 0$. In order to find δ , we will need

a **CONSTRAINT** on $|x + 3|$. If we assume $|x + 3| < 1$, the BEST interval of solutions for δ is .

..
Your Answer: $\left(0, \min\left\{1, \frac{\varepsilon}{7}\right\}\right]$

Correct Answer: $\left(0, \min\left\{1, \frac{\varepsilon}{7}\right\}\right]$

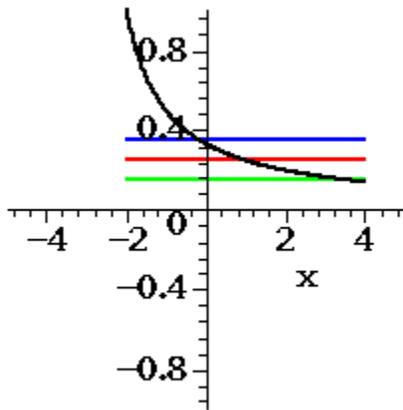
Comment:

Question 5: Score 1/1

$$\lim_{x \rightarrow 1} \left(\frac{1}{x+3} \right) = \frac{1}{4}$$

In the plot below, the black curve is $y = \frac{1}{x+3}$. The red line is $y = 1/4$. The blue and green lines respectively are

$$y = \frac{1}{4} + \varepsilon \text{ and } y = \frac{1}{4} - \varepsilon. \text{ We want } \frac{1}{4} - \varepsilon < y < \frac{1}{4} + \varepsilon.$$



Correct

In proving $\lim_{x \rightarrow 1} \left(\frac{1}{x+3} \right) = \frac{1}{4}$, we let $\varepsilon > 0$. In order to find δ , we will need

a CONSTRAINT on $|x - 1|$. If we assume $|x - 1| < 1$, the BEST interval of solutions for δ is . . .

Your Answer: $(0, \min\{1, 12 \cdot \varepsilon\}]$

Correct Answer: $(0, \min\{1, 12 \cdot \varepsilon\}]$

Comment:

Question 6: Score 1/1

For every $N < 0$ there is a $\delta > 0$ such that when $0 < x - a < \delta$ then $f(x) < N$.

This is the definition for . . .



Correct

Your Answer: $\lim_{x \rightarrow a^+} f(x) = -\infty$

Correct Answer: $\lim_{x \rightarrow a^+} f(x) = -\infty$

Comment:

Question 7: Score 1/1

For every $\varepsilon > 0$ there is a $\delta > 0$ such that when $0 < x - a < \delta$ then $|f(x) - L| < \varepsilon$.

This is the definition for ...



Correct

Your Answer: $\lim_{x \rightarrow a^+} f(x) = L$

Correct Answer: $\lim_{x \rightarrow a^+} f(x) = L$

Comment:

Question 8: Score 1/1

For every $N < 0$ there is a $\delta > 0$ such that when $0 < a - x < \delta$ then $f(x) < N$.

This is the definition for ...



Correct

Your Answer: $\lim_{x \rightarrow a^-} f(x) = -\infty$

Correct Answer: $\lim_{x \rightarrow a^-} f(x) = -\infty$

Comment:

Question 9: Score 1/1

For every $N > 0$ there is an $\delta > 0$ such that when $0 < |x - a| < \delta$ then $f(x) > N$.

This is the definition for ...



Correct

Your Answer: $\lim_{x \rightarrow a} f(x) = \infty$

Correct Answer: $\lim_{x \rightarrow a} f(x) = \infty$

Comment:

Test 5: Continuity and Differentiation

Question 1: Score 1/1

If $\lim_{h \rightarrow 0} f(x + h) = f(x)$, then we can conclude that f is continuous at

(Click beside each correct statement. We will need this formulation of continuity when we prove **THE PRODUCT RULE FOR DERIVATIVES!**)

Choice	Selected	✓/✗	Points
0	No		
h	No		
everywhere	No		
x	Yes	✓	+1
$-h$	No		



Correct

Number of available correct choices: 1

[Partial Grading Explained](#)

Comment:

Question 2: Score 1/1

If $y = f(x)$ is continuous at $x = a$, then

(Click beside each correct statement.)

Choice	Selected	✓/✗	Points
$\lim_{x \rightarrow a} f(x)$ exists	Yes	✓	+1
$y = f(x)$ is continuous at $x = a$ from both the left and the right.	Yes	✓	+1
$\lim_{x \rightarrow a} f(x) = f(a)$	Yes	✓	+1
$\lim_{x \rightarrow a^-} f(x) = \lim_{x \rightarrow a^+} f(x)$	Yes	✓	+1
$f(a)$ exists	Yes	✓	+1



Correct

Number of available correct choices: 5

[Partial Grading Explained](#)

Comment:

Question 3: Score 1/1

$f(x) = \ln(|x + 1|)$ is discontinuous at $x = \underline{\hspace{1cm}}$ because $\underline{\hspace{1cm}}$

(More than one selection may be correct. Keep in mind that if a function tends to infinity as $x \rightarrow a$, the limit does not exist at a .)

Choice	Selected	✓/✗	Points
-1 because $f(-1)$ does not exist.	Yes	✓	+1
-1 because $\lim_{x \rightarrow -1^-} f(x) \neq \lim_{x \rightarrow -1^+} f(x)$	No		
1 because $\lim_{x \rightarrow 1} f(x)$ does not exist.	No		
1 because $f(1)$ does not exist.	No		
-1 because $\lim_{x \rightarrow -1} f(x)$ does not exist.	Yes	✓	+1



Correct

Number of available correct choices: 2

[Partial Grading Explained](#)

Comment:

Question 4: Score 1/1

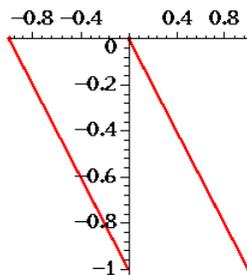
Your response	Correct response
<p>The function $f(x) = \text{floor}(x) - x$ is continuous from right at $x = 0$. (100%)</p> <p>Note: $\text{floor}(x)$ is Maple's name for $\lfloor x \rfloor$, the "greatest integer less than or equal to x".</p>	<p>The function $f(x) = \text{floor}(x) - x$ is continuous from right at $x = 0$.</p> <p>Note: $\text{floor}(x)$ is Maple's name for $\lfloor x \rfloor$, the "greatest integer less than or equal to x".</p>



Correct

Comment:

The plot below shows the function $f(x)$ is continuous from just the right at $x = 0$.



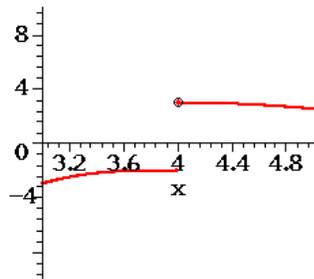
Question 5: Score 1/1

Your response	Correct response
<p>The function $f(x) =$</p> $\begin{cases} (x-4)^3 - 2 & x < 4 \\ \cos(x-4) + 2 & 4 \leq x \end{cases}$ <p>is continuous from right at $x = 4$. (100%)</p>	<p>The function $f(x) =$</p> $\begin{cases} (x-4)^3 - 2 & x < 4 \\ \cos(x-4) + 2 & 4 \leq x \end{cases}$ <p>is continuous from right at $x = 4$.</p>



Comment:

The plot below shows the function $f(x)$ is continuous from just the right at $x = 4$.



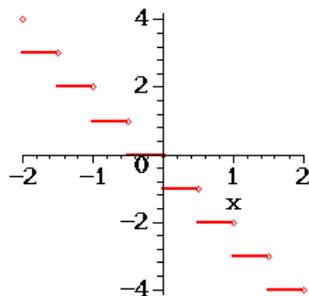
Question 6: Score 1/1

Your response	Correct response
<p>The function $f(x) = \text{floor}(-2x)$ is continuous from the left at $x = -1$. (100%)</p> <p>Note: $\text{floor}(x)$ is Maple's name for $\llbracket x \rrbracket$, the "greatest integer less than or equal to x".</p>	<p>The function $f(x) = \text{floor}(-2x)$ is continuous from the left at $x = -1$.</p> <p>Note: $\text{floor}(x)$ is Maple's name for $\llbracket x \rrbracket$, the "greatest integer less than or equal to x".</p>



Comment:

The plot below shows the function $f(x)$ is continuous from just the left at $x = -1$.



Question 7: Score 1/1

$y = 5\sqrt{x+3}\sqrt{1-x}$. Select the interval or intervals on which the function is continuous.

Choice	Selected	✓/✗	Points
$[-3, \infty)$	No		
$(-\infty, 1]$	No		
$(-\infty, -3)$	No		
$[-3, 1]$	Yes	✓	+1
$(-\infty, 1]$	No		
$(-\infty, \infty)$	No		
$(-\infty, -3]$	No		



Correct

Number of available correct choices: 1

[Partial Grading Explained](#)

Comment:

Question 8: Score 1/1

$y = 4(x+4)^{\frac{1}{4}}(x-1)^{\frac{1}{3}}$. Select the interval or intervals on which the function is continuous.

Choice	Selected	✓/✗	Points
$(-\infty, -4)$	No		
$(-\infty, -4]$	No		
$[-4, \infty)$	Yes	✓	+1
$(-\infty, \infty)$	No		
$(-\infty, 1]$	No		



Correct

Number of available correct choices: 1

[Partial Grading Explained](#)

Comment:

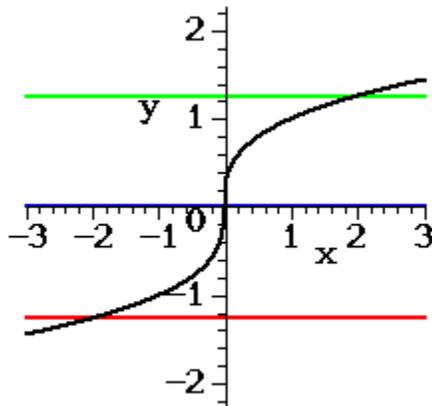
Question 9: Score 1/1

Let $y = \sqrt[3]{x}$, $a = -2$, $b = 2$ and $k = 0$. Note that $f(-2) = -\sqrt[3]{2} < k = 0 < f(2) = \sqrt[3]{2}$.

Find a value c between -2 and 2 (GUARANTEED BY THE INTERMEDIATE VALUE THEOREM) that satisfies $f(c) = 0$.

SPECIAL NOTE: If your answer is, for example, $(-9)^{(1/3)}$, enter $-9^{(1/3)}$. (Remember that the cubed root of -1 is -1 !)

(For this to work, f must be continuous on $[-2,2]$, which it is!)



Correct

In this plot, the red line is $y = -\sqrt[3]{2}$, the green line is $y = \sqrt[3]{2}$, and the blue line is $y = 0$. The curve **ALWAYS** crosses the blue line. We are finding a c value (there is always at least one) where this happens.

Your Answer: 0

Correct Answer: 0

Comment:

Question 10: Score 1/1

If $\frac{df}{dx} = \lim_{x \rightarrow a} \frac{e^x - e^a}{x - a}$, then $f(x) = \dots$



Correct

Your Answer: e^x

Correct Answer: $\exp(x)$

Comment:

Question 11: Score 1/1

If $\frac{df}{dx} = \lim_{h \rightarrow 0} \frac{\sin(x+h) - \sin(x)}{h}$, then $f(x) = \dots$



Correct

Your Answer: $\sin(x)$

Correct Answer: $\sin(x)$

Question 12: Score 1/1

Find the slope of the tangent to $y = x^3 - 4$ at $x = -4$.

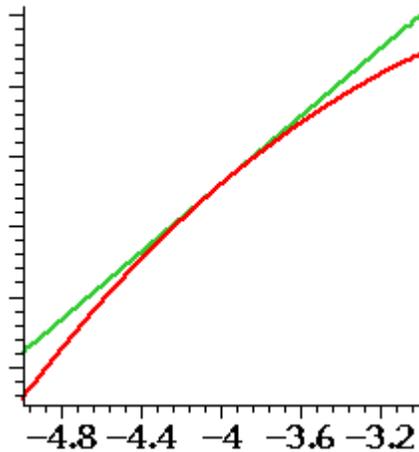


Correct

Your Answer: 48

Correct Answer: 48

Comment:



The curve $y = x^3 - 4$ is red and the tangent line to the curve at $x = -4$ is green (with envy?)

Question 13: Score 1/1

$$\text{If } f(x) = \begin{cases} x^2 - 32 & x < -5 \\ -4 & x = -5 \\ -10x - 52 & -5 < x \end{cases}$$



Correct

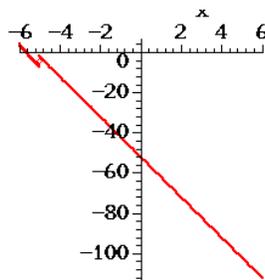
then at $x = -5$, f is

(Note that the option "differentiable but NOT continuous is NOT a choice. Why not?)

Your Answer: discontinuous from both the left and the right.

Correct Answer: discontinuous from both the left and the right.

Comment:



Question 14: Score 1/1

$$\text{If } f(x) = \begin{cases} x^2 - 8 & x < -2 \\ -4x - 7 & -2 \leq x \end{cases},$$

then at $x = -2$, f' is

(Note that the option "differentiable but **NOT** continuous is **NOT** a choice. Why not?)

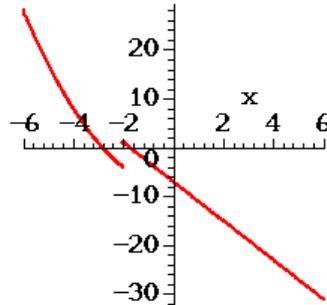


Correct

Your Answer: continuous and differentiable from the right only.

Correct Answer: continuous and differentiable from the right only.

Comment:



Question 15: Score 1/1

$$\text{If } f(x) = \begin{cases} x^2 - 2 & x \leq 0 \\ 3 & 0 < x \end{cases},$$

then at $x = 0$, f' is

(Note that the option "differentiable but **NOT** continuous is **NOT** a choice. Why not?)

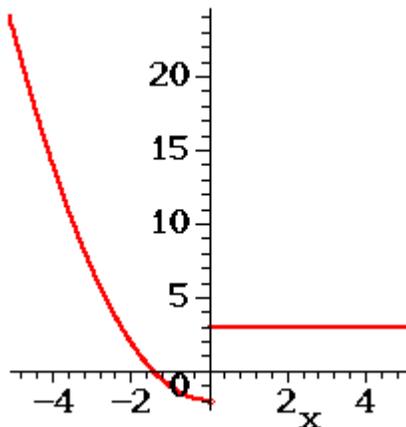


Correct

Your Answer: continuous and differentiable from the left only.

Correct Answer: continuous and differentiable from the left only.

Comment:



Test 6: Derivative Rules and Related Rates

Question 1: Score 1/1

Evaluate $\lim_{x \rightarrow 0} \frac{\cos(2x) - 1}{x}$



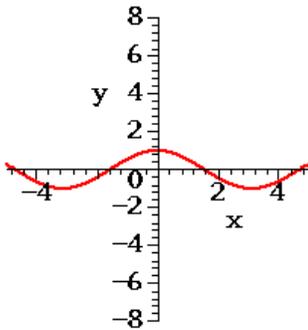
Correct

Your Answer: 0

Correct Answer: 0

Comment: Recall, $\lim_{x \rightarrow 0} \frac{\sin(x)}{x} = 1$.

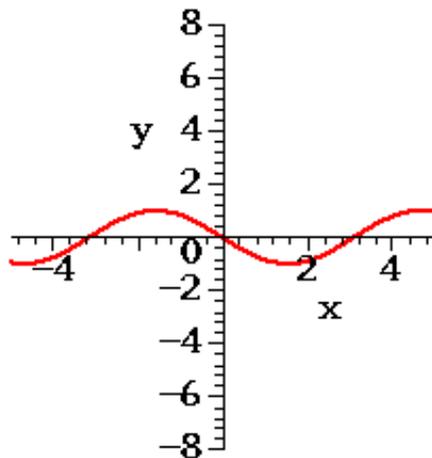
Question 2: Score 1/1



Correct

Above is the graph of a function $y = f(x)$. Which of the following is the graph of $y = f'(x)$?

Your Answer:



Question 3: Score 1/1

Find $\frac{dy}{dx}$ if $y = \frac{\tan(3x)}{\sin(2x)}$.

Remember that in TA, $\sin(x)^2$ means $\sin^2(x)$.

Be very careful entering your answer and don't worry about simplifying. Make sure you use *, brackets, ^, and / properly. Use the preview button to check your syntax.

Your Answer: $(3+3*\tan(3*x)^2)/\sin(2*x)-2*\tan(3*x)/\sin(2*x)^2*\cos(2*x)$

Correct Answer: $(3+3*\tan(3*x)^2)/\sin(2*x)-2*\tan(3*x)/\sin(2*x)^2*\cos(2*x)$ or $(\sin(2*x)*(3+3*\tan(3*x)^2)-$

Answer: $2*\tan(3*x)*\cos(2*x))/\sin(2*x)^2$

Using the quotient rule, $\frac{d}{dx} \left(\frac{f(x)}{g(x)} \right) = \frac{f'(x) \cdot g(x) - g'(x) \cdot f(x)}{(g(x))^2}$

Comment: taking $f(x) = \tan(3x)$ and $g(x) = \sin(2x)$,

$$\frac{dy}{dx} = [(3 + 3 \tan^2(3x)) \cdot (\sin(2x)) - (2 \cos(2x)) \cdot (\tan(3x))] / (\sin(2x))^2$$



Correct

Question 4: Score 1/1

Find $\frac{dy}{dx}$ if $y = (\sin(x+4)) \cdot (2x^3 - 5x - 1)$.

Remember that in TA, $\sin(x)^2$ means $\sin^2(x)$.

Be very careful entering your answer and don't worry about simplifying. Make sure you use *, brackets, and ^ properly. Use the preview button to check your syntax.

Your Answer: $\cos(x+4)*(2*x^3-5*x-1)+\sin(x+4)*(6*x^2-5)$

Correct Answer: $\cos(x+4)*(2*x^3-5*x-1)+\sin(x+4)*(6*x^2-5)$

Using the product rule $\frac{d}{dx}(f(x) \cdot g(x)) = f'(x) \cdot g(x) + g'(x) \cdot f(x)$

Comment: take $f(x) = \sin(x+4)$ and $g(x) = 2x^3 - 5x - 1$,

$$\frac{dy}{dx} = (\cos(x+4)) \cdot (6x^2 - 5) + (2x^3 - 5x - 1) \cdot (\sin(x+4))$$



Correct

Question 5: Score 1/1

Find $\frac{dy}{dx}$ if $y = (4x^2 - 3x - 5)^7$.

Remember that in TA, $\sin(x)^2$ means $\sin^2(x)$.

Be very careful entering your answer and don't worry about simplifying. Make sure you use *, brackets, ^, and / properly. Use the preview button to check your syntax.

Your Answer: $7*(4*x^2-3*x-5)^6*(8*x-3)$

Correct Answer: $7*(4*x^2-3*x-5)^6*(8*x-3)$

Comment:



Correct

Question 6: Score 1/1

Find $\frac{d^2y}{dx^2}$ if $y = \sin(4x + 2)$.



Correct

Your Answer: $-16*\sin(4*x+2)$

Correct Answer: $-16*\sin(4*x+2)$

$$y = \sin(4x + 2)$$

Comment: $\frac{dy}{dx} = 4 \cos(4x + 2)$

$$\frac{d^2y}{dx^2} = -16 \sin(4x + 2)$$

Question 7: Score 1/1

Find $\frac{d^2y}{dx^2}$ if $x^2 + y^2 = 4$.



Correct

Your Answer: $-(x^2+y^2)/y^3$

Correct Answer: $-(x^2+y^2)/y^3$

Comment:

Question 8: Score 1/1

Find $\frac{dy}{dx}$ if $\tan(2xy) = x + y$.



Correct

Your Answer: $-(2*y+2*\tan(2*x*y)^2*y-1)/(2*x+2*\tan(2*x*y)^2*x-1)$

Correct Answer: $-(2*y+2*\tan(2*x*y)^2*y-1)/(2*x+2*\tan(2*x*y)^2*x-1)$

Comment:

Question 9: Score 1/1

A point moves along the circle $x^2 + y^2 = 25$ so that $\frac{dy}{dt} = -13$ cm/min. Find $\frac{dx}{dt}$ at the point $(-1, -\sqrt{24})$.



Correct

Your Answer: $26 \cdot 6^{(1/2)}$ cm/min

Correct Answer: $26 \cdot 6^{(1/2)}$ cm/min

Comment: $x^2 + y^2 = 25$ therefore, differentiating both sides with respect to t yields:

$$2x \frac{dx}{dt} + 2y \frac{dy}{dt} = 0$$

plugging in the information we know, this gives:

$$2 \cdot (-1) \cdot \frac{dx}{dt} + 2 \cdot (-2 \cdot 6^{(1/2)}) \cdot (-13) = 0.$$

Solving for $\frac{dx}{dt}$, we find $\frac{dx}{dt} = 26 \cdot 6^{(1/2)}$ cm/min.

Question 10: Score 1/1



Correct

The radius of a spherical snowperson's head is melting under the MILD sun at the rate of $-3/5$ cm/h (centimetres per hour.) Find the rate at which the volume is changing when the volume is $V = 500/3 \cdot \pi$. Use the abbreviation **cc/h** for cubic centimetres per hour. Don't forget to use * for multiplication and brackets where necessary.

(The volume of a sphere is given by $V = \frac{4}{3} \pi \cdot r^3$.)

Your Answer: $-60 \cdot \pi$ cc/h

Correct Answer: $-60 \cdot \pi$ cc/h

Comment: $V = \frac{4}{3} \cdot \pi \cdot r^3$, taking the derivative with respect to t on both sides, we find:

$$\frac{dV}{dt} = 4 \cdot \pi \cdot r^2 \cdot \frac{dr}{dt} (*)$$

We know $\frac{dr}{dt} = -3/5$, we need to find what r is when $V = 500/3 \cdot \pi$. To do this we solve

$500/3 \cdot \pi = \frac{4}{3} \cdot \pi \cdot r^3$, giving $r = 5$. Substituting this values into (*) we find,

$$\frac{dV}{dt} = 4 \cdot \pi \cdot (5)^2 \cdot (-3/5) = -60 \cdot \pi \text{ cc/hr.}$$

Question 11: Score 1/1



Correct

The spherical head of a snowperson is melting under the HOT sun at the rate of -200 cc/h (cubic centimetres per hour.) Find the rate at which the radius is changing when the radius $r = 20$. **Use cm/h for the units.** Don't forget to use * for multiplication. Also, $\frac{1}{8 \cdot \pi}$ would be entered as $1/(8 \cdot \pi)$. Don't forget those brackets!

(The volume of a sphere is given by $V = \frac{4}{3} \pi \cdot r^3$.)

Your Answer: $-1/(8 \cdot \pi)$ cm/h

Correct Answer: $-1/8 \cdot \pi$ cm/h

Comment:

$V = \frac{4}{3} \cdot \pi \cdot r^3$, taking the derivative with respect to t on both sides gives us:

$$\frac{dV}{dt} = 4 \cdot \pi \cdot r^2 \cdot \frac{dr}{dt}, \text{ substituting the information we know we find:}$$

$$-200 = 4 \cdot \pi \cdot (20)^2 \cdot \frac{dr}{dt}, \text{ solving for } \frac{dr}{dt} \text{ we find:}$$

$$\frac{dr}{dt} = -\frac{1}{8 \pi} \text{ cm/h}$$

Test 7: Differentials & Max/Min/Inflection Points & Rolle's and Mean Value Theorem

Question 1: Score 1/1

If $y = x^{-\frac{1}{3}}$, then the differential of y , $dy =$



Correct

Your Answer: $-1/3/x^{(4/3)}*dx$

Correct Answer: $-1/3/x^{(4/3)}*dx$

$$f(x) = x^{-\frac{1}{3}}$$

Comment: $\frac{dy}{dx} = -\frac{1}{3x^{\frac{4}{3}}}$, therefore $dy = \left(-\frac{1}{3x^{\frac{4}{3}}}\right) \cdot dx$.

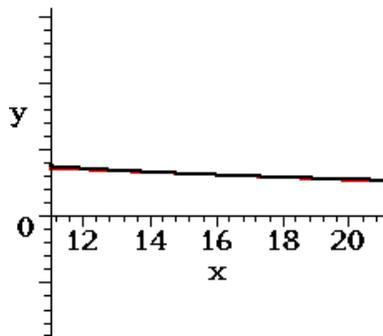
Question 2: Score 1/1

Your response	Correct response
<p>In order to estimate $\sqrt{\frac{1}{16.2}}$, choose an appropriate function $f(x)$, a value a at which to evaluate f and an appropriate value for dx.</p> <p>$f(x) = 1/\text{sqrt}(x)$ (33%)</p> <p>$a = 16$ (33%)</p> <p>$dx = .2$ (33%)</p>	<p>In order to estimate $\sqrt{\frac{1}{16.2}}$, choose an appropriate function $f(x)$, a value a at which to evaluate f and an appropriate value for dx.</p> <p>$f(x) = 1/\text{sqrt}(x)$</p> <p>$a = 16$</p> <p>$dx = .2$</p>



Correct

Comment:



The curve is black and the tangent line at $x = 16$ is red. Notice how closely the tangent line follows the curve near $x = 16$.

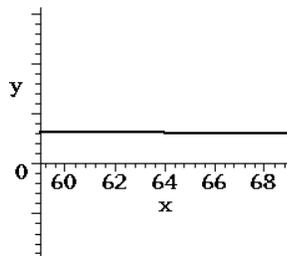
Question 3: Score 1/1

Your response	Correct response
<p>In order to estimate $\left(\frac{1}{63.8}\right)^{\frac{1}{3}}$, choose an appropriate function $f(x)$, a value a at which to evaluate f and an appropriate value for dx.</p> <p>$f(x) = 1/x^{(1/3)}$ (33%)</p> <p>$a = 64$ (33%)</p> <p>$dx = -.2$ (33%)</p>	<p>In order to estimate $\left(\frac{1}{63.8}\right)^{\frac{1}{3}}$, choose an appropriate function $f(x)$, a value a at which to evaluate f and an appropriate value for dx.</p> <p>$f(x) = 1/x^{(1/3)}$</p> <p>$a = 64$</p> <p>$dx = -.2$</p>



Correct

Comment:



The curve is black and the tangent line at $x = 64$ is red. Notice how closely the tangent line follows the curve near $x = 64$.

Question 4: Score 1/1

Estimate $\sqrt{\frac{1}{3.8}}$, using differentials. **PLEASE** do not defeat the purpose of the question by using a calculator. Enter your answer as a **RATIONAL** number. (For example, enter 2.1 as $\frac{21}{10}$.)



Correct

Your Answer: 41/80

Correct Answer: 41/80

Choose $f(x) = \sqrt{\frac{1}{x}} = x^{-\frac{1}{2}}$, $a = 4$ and $dx = -0.2$.

Comment:

$$\frac{dy}{dx} = \left(-\frac{1}{2}\right) \cdot x^{-\frac{3}{2}}, \text{ therefore } dy = \left(-\frac{1}{2}\right) \cdot x^{-\frac{3}{2}} \cdot dx$$

this means for our chosen values of a and dx ,

$$dy = \left(-\frac{1}{2}\right) \cdot (4)^{\left(-\frac{3}{2}\right)} \cdot (-0.2) = 1/80.$$

$$\text{Therefore } \sqrt{\frac{1}{3.8}} = f(4) + \Delta y \approx f(4) + dy = \frac{1}{\sqrt{4}} + 1/80 = 41/80.$$

Question 5: Score 1/1

Estimate $(7.8)^{\frac{1}{3}}$, using differentials. **PLEASE** do not defeat the purpose of the question by using a calculator. Enter your answer as a **RATIONAL** number. (For example, enter 2.1 as $\frac{21}{10}$.)



Correct

Your Answer: 119/60

Correct Answer: 119/60

Choose $f(x) = x^{\frac{1}{3}}$, $a = 8$ and $dx = -0.2$.

$$\frac{dy}{dx} = \left(\frac{1}{3}\right) \cdot x^{-\frac{2}{3}}, \text{ therefore } dy = \left(\frac{1}{3}\right) \cdot x^{-\frac{2}{3}} \cdot dx$$

Comment: this means for our chosen values of a and dx ,

$$dy = \left(\frac{1}{3}\right) \cdot (8)^{\left(-\frac{2}{3}\right)} \cdot (-0.2) = -1/60.$$

$$\text{Therefore } 7.8^{\frac{1}{3}} = f(8) + \Delta y \approx f(8) + dy = 8^{\frac{1}{3}} + -1/60 = 119/60.$$

Question 6: Score 1/1

The function $f(x) = -2x^2 - 4x + 1$ satisfies the conditions for **ROLLE'S THEOREM** on the interval $(-2, 0)$. Find the guaranteed c value between $a = -2$ and $b = 0$ that satisfies $f'(c) = 0$.

(There may be more than one choice for c in some examples, but not here.)

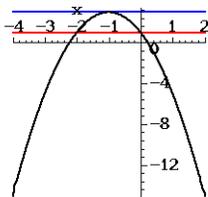


Correct

Your Answer: -1

Correct Answer: -1

Comment:



The curve is black and the line joining (-2,1) to (0,1) is red. The guaranteed tangent line with slope 0 is blue.

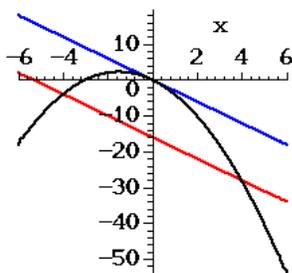
Question 7: Score 1/1

Your response	Correct response
<p>The function $f(x) = -x^2 - 3x$ satisfies the conditions for THE MEAN VALUE THEOREM on the interval</p> <p>$[-4, 4]$. Find the slope $m = \frac{f(b) - f(a)}{b - a}$ and the guaranteed value c between $a = -4$ and $b = 4$ that satisfies $f'(c) = \frac{f(b) - f(a)}{b - a}$</p> <p>(There may be more than one choice for $f'(c) = \frac{f(b) - f(a)}{b - a}$ in some examples, but not here.)</p> <p>$m = -3$ (50%)</p> <p>$c = 0$ (50%)</p>	<p>The function $f(x) = -x^2 - 3x$ satisfies the conditions for THE MEAN VALUE THEOREM on the interval</p> <p>$[-4, 4]$. Find the slope $m = \frac{f(b) - f(a)}{b - a}$ and the guaranteed value c between $a = -4$ and $b = 4$ that satisfies $f'(c) = \frac{f(b) - f(a)}{b - a}$</p> <p>(There may be more than one choice for $f'(c) = \frac{f(b) - f(a)}{b - a}$ in some examples, but not here.)</p> <p>$m = -3$</p> <p>$c = 0$</p>



Correct

Comment:



The curve $f(x) = -x^2 - 3x$ is black and the line joining $(-4, f(-4))$ to $(4, f(4))$ is red (where $a = -4$ and $b = 4$).

The guaranteed tangent line with slope $\frac{f(b) - f(a)}{b - a}$ (only one in this example) is in blue. The point of tangency is $(0, 0)$.

Question 8: Score 1/1

Click beside each true statement.

Choice	Selected	✓/✗	Points
If $y=f(x)$ has a maximum or minimum at the point $(a, f(a))$, then $f'(a)=0$.	No		
If $(a, f(a))$ is a cusp point or a point of inflection with a vertical tangent , then $ f'(a) $ is infinite	Yes	✓	+1
A continuous function has a maximum or minimum point at $(a,f(a))$ if and only if $f'(a)=0$ or $(a,f(a))$ is a corner point or $(a,f(a))$ is a cusp point or $(a,f(a))$ is an endpoint.	Yes	✓	+1
If $f'(a)=0$ then $f(x)$ has either a maximum or a minimum point at $(a, f(a))$.	No		
If $(a, f(a))$ is a corner point, $f'_-(a) \neq f'_+(a)$.	Yes	✓	+1



Correct

Number of available correct choices: 3

[Partial Grading Explained](#)

Comment:

Question 9: Score 1/1

The function $y = - (x - 4)^{\frac{2}{5}}$ has derivative $\frac{dy}{dx} = - \frac{2}{5} (x - 4)^{-\frac{3}{5}}$. At $x = 4$, there is a . . .

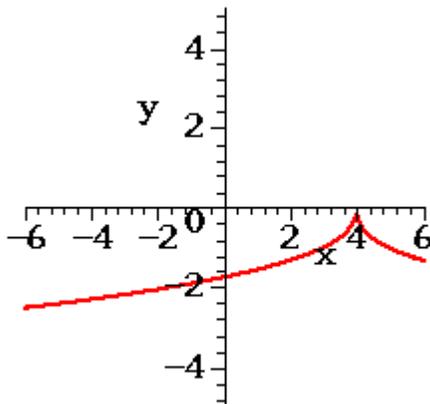


Correct

Your Answer: a cusp point (ie., vertical tangent) maximum.

Correct Answer: a cusp point (ie., vertical tangent) maximum.

Comment:



At $x = 4$, there is a **vertical tangent maximum**. Note that the

derivative $\frac{dy}{dx} = -\frac{2}{5}(x-4)^{\frac{-3}{5}}$ **CHANGES SIGN** from positive to negative as x passes through 4.

The function increases and then decreases--and that's a MAX!

Notice that the exponent on $x - 4$ is between 0 and 1. **If it had been greater than 1, then $x = 4$ would have been a VERTICAL ASYMPTOTE.**

Question 10: Score 1/1

The function $y = \sqrt[3]{(x+2)}$ has derivative $\frac{dy}{dx} = \frac{1}{3(x+2)^{\frac{2}{3}}}$. At $x = -2$, there is a . . .

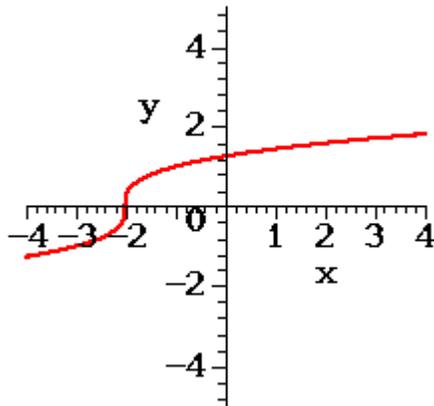


Correct

Your Answer: a point of inflection with a vertical tangent.

Correct Answer: a point of inflection with a vertical tangent.

Comment:



At $x = -2$, there is a **vertical tangent point of inflection**. Note that the

derivative $\frac{dy}{dx} = \frac{1}{3(x+2)^{\frac{2}{3}}}$ **DOES NOT CHANGE SIGN** as x passes through -2. The function

either increases on both sides of -2 or decreases on both sides of -2. So it can't be a max or min!

Notice that the exponent on $x + 2$ is between 0 and 1. **If it had been greater than 1, then $x = -2$ would have been a VERTICAL ASYMPTOTE.**

Question 11: Score 1/1

The function $y = -(x - 1)^2$ has derivative $\frac{dy}{dx} = -2x + 2$. At $x = 1$, there is a . . .

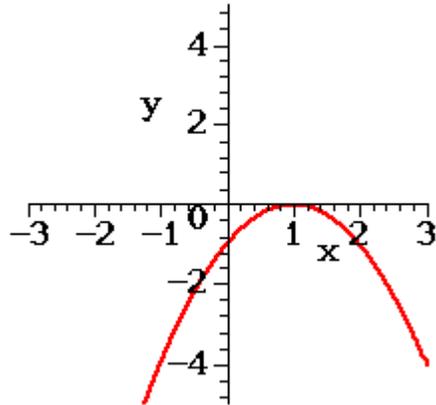


Correct

Your Answer: a horizontal tangent maximum.

Correct Answer: a horizontal tangent maximum.

Comment:



At $x = 1$, there is a **horizontal tangent maximum**. Note that the derivative $\frac{dy}{dx} = -2x + 2$ **CHANGES**

SIGN from positive to negative as x passes through 1. The function increases and then decreases--and that's a MAX!

Question 12: Score 1/1

At $x = 0$, the function $y = x^{\frac{2}{5}}$ has a . . .

(Note that the derivative of $y = x^{\frac{2}{5}}$ is $\frac{dy}{dx} = \frac{2}{5} x^{-\frac{3}{5}}$.)

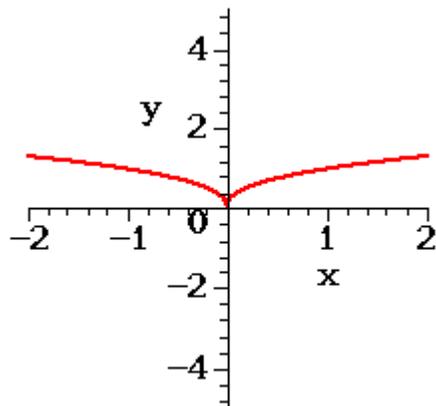


Correct

Your Answer: a cusp point (ie., vertical tangent) minimum.

Correct Answer: a cusp point (ie., vertical tangent) minimum.

Comment:



At $x = 0$, there is a **vertical tangent minimum**. Note that the derivative $\frac{dy}{dx} = \frac{2}{5} x^{-\frac{3}{5}}$ **CHANGES**

SIGN from negative to positive as x passes through 0. The function decreases and then increases--and that's a MIN!

Notice also the exponent on x in the denominator is between 0 and 1. **If it had been greater than 1**, $x = 0$ would have been a **VERTICAL ASYMPTOTE**.

Test 8: Graph Sketching

Question 1: Score 1/1

State the x intercept(s) using set notation, that is, $\{ \}$, for the function $f(x) = x^{5/3} - 8x^{2/3}$. Enter N (for NONE!) if there aren't any.



Correct

Your Answer: $\{0,8\}$

Correct Answer: $\{0, 8\}$

Comment: To find x intercepts, set $y = 0$ and solve.

Question 2: Score 1/1

State the y intercept for the function $f(x) = 7x^{5/3} - 2x^{2/3} - 2$. Enter N (for NONE!) if there isn't one.



Correct

Your Answer: -2

Correct Answer: -2

Comment: To find y intercepts, set $x = 0$.

Question 3: Score 1/1

Vertical asymptotes are finite x values, that is $x = a$, where y approaches either plus or minus infinity.**

List in set notation the equation(s) $x = a$ that give the vertical asymptotes

of $y = \frac{1}{(x-2)^2(x+2)}$.

eg., $\{x = 1, x = 5\}$

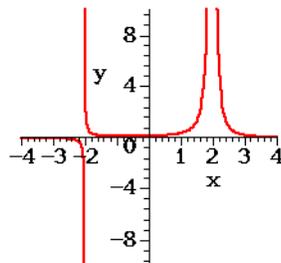
**Vertical Asymptotes are finite x values that make y infinite.

Horizontal Asymptotes are finite y values that make x infinite.

Your Answer: $\{x=-2, x=2\}$

Correct Answer: $\{x = -2, x = 2\}$

Comment:

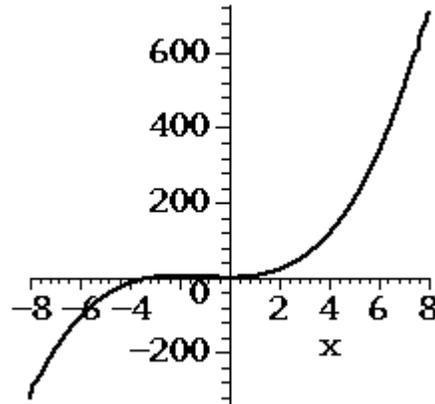
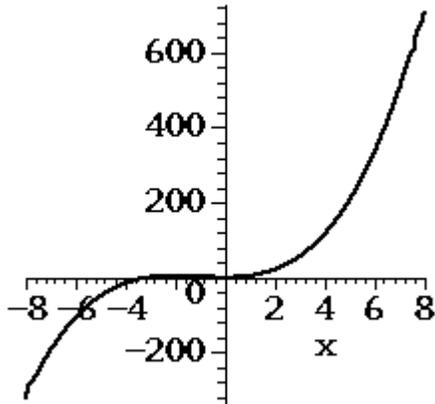


Correct

Remember, vertical asymptotes are of the form $x = a$.

Question 4: Score 1/1

Your response	Correct response
---------------	------------------



Above is the graph of the cubic polynomial $y = x^3 + 3x^2$, which has a single point of inflection. Find

- (a) the point of inflection (x, y) .
(-1, 2) (50%)
- (b) the slope of the tangent line at the point of inflection.
-3 (50%)

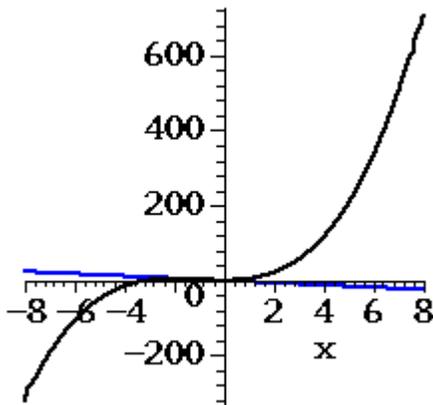
Give **EXACT** answers.

Above is the graph of the cubic polynomial $y = x^3 + 3x^2$, which has a single point of inflection. Find

- (a) the point of inflection (x, y) .
(-1, 2)
- (b) the slope of the tangent line at the point of inflection.
-3

Give **EXACT** answers.

Comment:



The polynomial $y = x^3 + 3x^2$ is black and the tangent line at the single inflection point is blue. The slope of this tangent line may not look like -3. If this is the case, the scale on the axes will not be one to one.

Question 5: Score 1/1

The function $y = f(x)$ has derivative $\frac{dy}{dx} = \sqrt[3]{((x + 2)^2)} (x - 4) (x - 9)$. Find the intervals on which $y = f(x)$ is increasing. Give your answer using interval notation. Use infinity for ∞ and U for union.



Correct

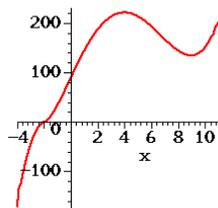
Hint: Increasing is **NOT** the same as $\frac{dy}{dx} > 0$. For example, $f(x) = x^4$ is increasing on $[0, \infty)$ but has positive derivative on $(0, \infty)$.

Your Answer: $(-\infty, 4] \cup [9, \infty)$

Correct Answer: $(-\infty, 4] \cup [9, \infty)$

Here is the plot of $y = f(x)$. Look at where the graph is increasing! Does it match your choice of intervals?

Comment:



Question 6: Score 1/1

The function $y = f(x)$ has derivative $\frac{dy}{dx} = -3(x + 3)(x - 1)(x - 8)$. Find the intervals on which $y = f(x)$ is increasing. Give your answer using interval notation. Use infinity for ∞ and U for union.



Correct

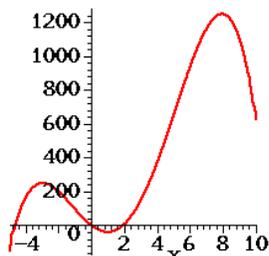
Hint: Increasing is **NOT** the same as $\frac{dy}{dx} > 0$. For example, $f(x) = x^4$ is increasing on $[0, \infty)$ but has positive derivative on $(0, \infty)$.

Your Answer: $(-\infty, -3] \cup [1, 8]$

Correct Answer: $(-\infty, -3] \cup [1, 8]$

Here is the plot of $y = f(x)$. Look at where the graph is increasing! Does it match your choice of intervals?

Comment:



Question 7: Score 1/1

The function $y = f(x)$ has derivative $\frac{dy}{dx} = \frac{(x+2)(x-6)}{\sqrt[3]{x-1}}$. Find the intervals on

which $y = f(x)$ is increasing. Give your answer using interval notation. Use infinity for ∞ and U for union.

Hint: Increasing is **NOT** the same as $\frac{dy}{dx} > 0$. For example, $f(x) = x^4$ is increasing on $[0, \infty)$ but has positive derivative on $(0, \infty)$.

Another Hint: The derivative is undefined at $x = 1$, but because the exponent on $(x - 1)$ is between 0 and 1, 1 **IS** in the domain of f .

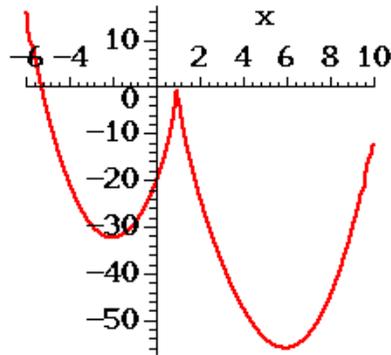


Correct

Your Answer: $[-2, 1] \cup [6, \infty)$

Correct Answer: $[-2, 1] \cup [6, \infty)$

Here is the plot of $y = f(x)$. Look at where the graph is increasing. Does this match your choice of intervals?



Comment:

Question 8: Score 1/1

The function $y = f(x)$ has derivative $\frac{dy}{dx} = \sqrt[3]{(x+3)^2} (x-4)(x-6)$. Find the intervals

on which $y = f(x)$ is decreasing. Give your answer using interval notation. Use infinity for ∞ and U for union.

Hint: Decreasing is **NOT** the same as $\frac{dy}{dx} < 0$. For example, $f(x) = x^4$ is decreasing

on $(-\infty, 0]$ but has negative derivative on $(-\infty, 0)$.



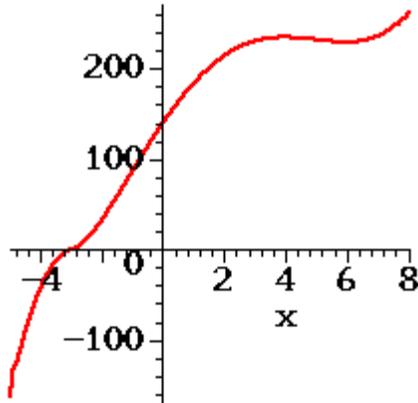
Correct

Your Answer: $[4, 6]$

Correct Answer: $[4, 6]$

Here is the plot of $y = f(x)$. Look at where the graph is decreasing! Does it match your choice of intervals?

Comment:



Question 9: Score 1/1

The function $y = f(x)$ has derivative $\frac{dy}{dx} = \frac{(x + 8)(x - 6)}{\sqrt[3]{(x - 1)^2}}$. Find the intervals on

which $y = f(x)$ is decreasing. Give your answer using interval notation. Use infinity for ∞ and U for union.

Hint: Decreasing is **NOT** the same as $\frac{dy}{dx} < 0$. For example, $f(x) = x^4$ is decreasing on $(-\infty, 0]$ but has negative derivative on $(-\infty, 0)$.

Another Hint: The derivative is undefined at $x = 1$, but because of the exponent on $(x - 1)$, 1 **IS** in the domain of f .



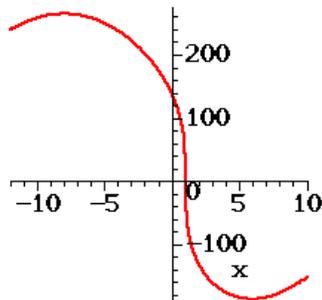
Correct

Your Answer: [-8,6]

Correct Answer: [-8, 6]

Here is the plot of $y = f(x)$. Look at where the graph is decreasing. Does this match your choice of intervals?

Comment:



Question 10: Score 1/1

The function $y = f(x)$ has second derivative $\frac{d^2y}{dx^2} = (x + 5)(x - 2)(x - 7)$. Find the intervals

on which $y = f(x)$ is concave up. Give your answer using interval notation. Use infinity for ∞ and U for union.



Correct

Hint: Concave up is **NOT** the same as $\frac{d^2y}{dx^2} > 0$. For example, $f(x) = x^5$ is concave up

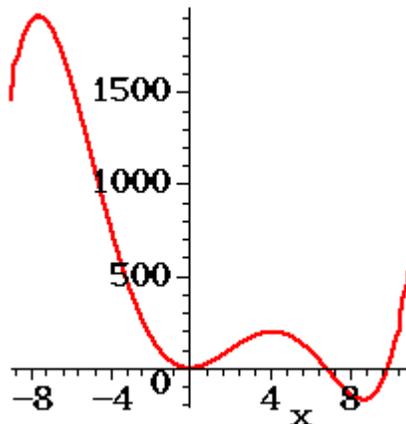
on $[0, \infty)$ while it has positive second derivative on $(0, \infty)$.

Your Answer: $[-5, 2] \cup [7, \infty)$

Correct Answer: $[-5, 2] \cup [7, \infty)$

Here is the plot of $y = f(x)$. Look at where the graph is concave up! Does it match your choice of intervals?

Comment:



Question 11: Score 1/1

The function $y = f(x)$ has second derivative $\frac{d^2y}{dx^2} = -3(x + 6)x(x - 6)$. Find the intervals

on which $y = f(x)$ is concave up. Give your answer using interval notation. Use infinity for ∞ and U for union.



Correct

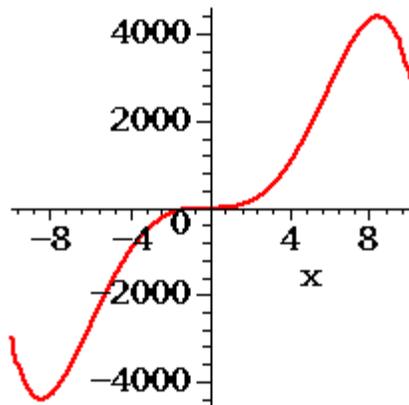
Hint: Concave up is **NOT** the same as $\frac{d^2y}{dx^2} > 0$. For example, $f(x) = x^5$ is concave up

on $[0, \infty)$ while it has positive second derivative on $(0, \infty)$.

Your Answer: $(-\infty, -6] \cup [0, 6]$

Correct Answer: $(-\infty, -6] \cup [0, 6]$

Comment: Here is the plot of $y = f(x)$. Look at where the graph is concave up! Does it match your choice of intervals?



Question 12: *Score 1/1*

The function $y = f(x)$ has second derivative $\frac{d^2y}{dx^2} = \sqrt[3]{(x + 5)(x - 1)(x - 8)}$. Find the intervals on which $y = f(x)$ is concave down. Give your answer using interval notation. Use infinity for ∞ and U for union.



Correct

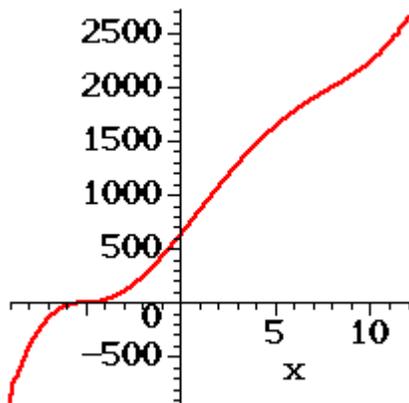
Hint: Concave down is NOT the same as $\frac{d^2y}{dx^2} < 0$. For example, $f(x) = -x^5$ is concave up on $[0, \infty)$ but has negative second derivative on $(0, \infty)$.

Your Answer: $(-\infty, -5] \cup [1, 8]$

Correct Answer: $(-\infty, -5] \cup [1, 8]$

Here is the plot of $y = f(x)$. Look at where the graph is concave down! Does it match your choice of intervals?

Comment:



Question 13: Score 1/1

The function $y = f(x)$ has second derivative $\frac{d^2y}{dx^2} = (x + 4)^2 (x - 1) (x - 6)$. Find the intervals

on which $y = f(x)$ is concave down. Give your answer using interval notation. Use infinity for ∞ and U for union.



Correct

Hint: Concave down is **NOT** the same as $\frac{d^2y}{dx^2} < 0$. For example, $f(x) = -x^5$ is concave down

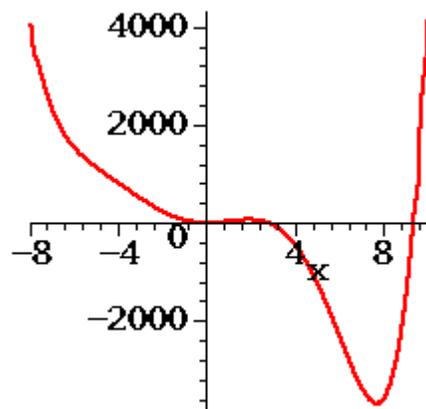
on $[0, \infty)$ while it has negative second derivative on $(0, \infty)$.

Your Answer: [1,6]

Correct Answer: [1, 6]

Here is the plot of $y = f(x)$. Look at where the graph is concave down! Does it match your choice of intervals?

Comment:



Test 9: Basic Integration and Riemann Sums

Question 1: Score 1/1

Find $\int (-\cos(x)) dx$.



Correct

Your Answer: $-\sin(x)+C$

Correct Answer: $-\sin(x)+C$

Comment:

Question 2: Score 1/1

Find $\int \frac{1}{3} \frac{x^4 - 2x^9 - 2x}{x} dx$.



Correct

Your Answer: $1/12*x^4-2/27*x^9-2/3*x+C$

Correct Answer: $1/12*x^4-2/27*x^9-2/3*x+C$

Make separate fractions

$$\int \frac{1}{3} \frac{x^4 - 2x^9 - 2x}{x} dx$$

Comment: $= \int \left(\frac{1}{3} x^3 - \frac{2}{3} x^8 - \frac{2}{3} \right) dx$

$$= \frac{1}{12} x^4 - \frac{2}{27} x^9 - \frac{2}{3} x + C$$

Question 3: Score 1/1

Find $\int (x^3 - 5)^2 dx$.



Correct

Your Answer: $1/7*x^7-5/2*x^4+25*x+C$

Correct Answer: $1/7*x^7-5/2*x^4+25*x+C$

Expand.

$$\int (x^3 - 5)^2 dx$$

Comment: $= \int (x^6 - 10x^3 + 25) dx$

$$= \frac{1}{7} x^7 - \frac{5}{2} x^4 + 25x + C$$

Question 4: Score 1/1

Find $\int (6x^5 \csc(x^6 + 3))^2 dx$.

HINT: This question is an example of **THE CHAIN RULE IN REVERSE**, with no "adjustments" needed.

$$\int g'(x)f'(g(x)) dx = f(g(x)) + C.$$



Correct

Your Answer: $-\cot(x^6+3)+C$

Correct Answer: $-\cot(x^6+3)+C$

Comment:

Question 5: Score 1/1

Find $\int (-\sin(x) \sin(7 \cos(x) - 4)) dx$.

HINT: This question is an example of **THE CHAIN RULE IN REVERSE**, but you will need to adjust the integrand with a **MULTIPLICATIVE CONSTANT!** For example,

$$\int x^2(x^3 + 1)^{\frac{3}{4}} dx = \frac{1}{3} \int (3 \cdot x^2)(x^3 + 1)^{\frac{3}{4}} dx = \frac{1}{3} \frac{(x^3 + 1)^{\frac{7}{4}}}{\left(\frac{7}{4}\right)} + C = \frac{4}{21}(x^3 + 1)^{\frac{7}{4}} + C$$



Correct

Your Answer: $-1/7*\cos(7*\cos(x)-4)+C$

Correct Answer: $-1/7*\cos(7*\cos(x)-4)+C$

Comment:

Question 6: Score 1/1

Your response	Correct response
<p>In order to find $\int (x - 4) (x + 4)^{\frac{3}{4}} dx$, we should use the substitution method.</p> <p>(a) Let $u = x+4$ (25%) so that</p> <p>(b) $du = dx$ (25%)</p> <p>(c) The transformed integral is $\int (u - 8) * u^{(3/4)}$ (25%) du</p> <p>(Just enter the integrand without du. As you can see, "du" is already entered by TA!)</p> <p>(d) Finally, after resubstituting for u in terms of x and adding $+C$, the answer is</p>	<p>In order to find $\int (x - 4) (x + 4)^{\frac{3}{4}} dx$, we should use the substitution method.</p> <p>(a) Let $u = x+4$ so that</p> <p>(b) $du = dx$</p> <p>(c) The transformed integral is $\int (u - 8) * u^{(3/4)} du$</p> <p>(Just enter the integrand without du. As you can see, "du" is already entered by TA!)</p> <p>(d) Finally, after resubstituting for u in terms of x and adding $+C$, the answer is</p>



Correct

$$\int (x-4)(x+4)^{\frac{3}{4}} dx$$

$$= \frac{4}{11} * (x+4)^{\frac{11}{4}} - \frac{32}{7} * (x+4)^{\frac{7}{4}} + C \quad (25\%)$$

Avoid frustration. Work out your answer to (d) carefully on paper and only then type it in. If you are using text entry, use the PREVIEW button to check that all your *, ^, and (,) 's are in place.

$$\int (x-4)(x+4)^{\frac{3}{4}} dx$$

$$= \frac{4}{11} * (x+4)^{\frac{11}{4}} - \frac{32}{7} * (x+4)^{\frac{7}{4}} + C$$

Avoid frustration. Work out your answer to (d) carefully on paper and only then type it in. If you are using text entry, use the PREVIEW button to check that all your *, ^, and (,) 's are in place.

Question 7: Score 1/1

Your response	Correct response
<p>In order to find $\int \frac{x-4}{(x+2)^3} dx$, we should use the substitution method.</p> <p>(a) Let $u = x+2$ (25%) so that</p> <p>(b) $du = dx$ (25%)</p> <p>(c) The transformed integral is $\int (u-6)/u^3 du$ (25%) (Just enter the integrand without du. As you can see, "du" is already entered by TA!)</p> <p>(d) Finally, after resubstituting for u in terms of x and adding $+C$, the answer is</p> $\int \frac{x-4}{(x+2)^3} dx = -\frac{1}{(x+2)} + \frac{3}{(x+2)^2} + C \quad (25\%)$ <p>Avoid frustration. Work out your answer to (d) carefully on paper and only then type it in. If you are using text entry, use the PREVIEW button to check that all your *, ^, and (,) 's are in place.</p>	<p>In order to find $\int \frac{x-4}{(x+2)^3} dx$, we should use the substitution method.</p> <p>(a) Let $u = x+2$ so that</p> <p>(b) $du = dx$</p> <p>(c) The transformed integral is $\int (u-6)/u^3 du$ (Just enter the integrand without du. As you can see, "du" is already entered by TA!)</p> <p>(d) Finally, after resubstituting for u in terms of x and adding $+C$, the answer is</p> $\int \frac{x-4}{(x+2)^3} dx = -\frac{1}{(x+2)} + \frac{3}{(x+2)^2} + C$ <p>Avoid frustration. Work out your answer to (d) carefully on paper and only then type it in. If you are using text entry, use the PREVIEW button to check that all your *, ^, and (,) 's are in place.</p>



Correct

Comment:

Question 8: Score 1/1

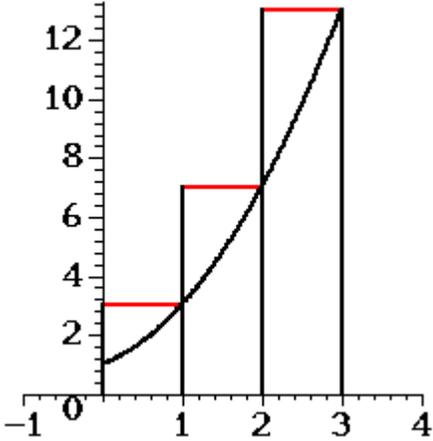
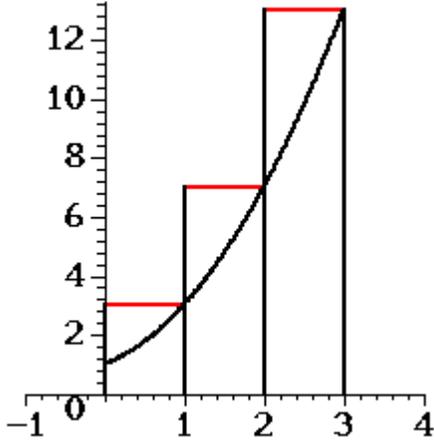
Your response	Correct response
<p>In order to find $\int (x + 3) \sqrt{2x - 3} \, dx$, we should use the substitution method.</p> <p>(a) Let $u = 2x - 3$ (25%) so that</p> <p>(b) $du = 2 \cdot dx$ (25%)</p> <p>(c) The transformed integral is $\int 1/4 \cdot (u+9) \cdot u^{(1/2)} \, du$ (Don't forget to substitute for dx.)</p> <p>(Just enter the integrand without du. As you can see, "du" is already entered by TA!)</p> <p>(d) Finally, after resubstituting for u in terms of x and adding $+C$, the answer is</p> $\int (x + 3) \sqrt{2x - 3} \, dx = 1/10 \cdot (2x - 3)^{(5/2)} + 3/2 \cdot (2x - 3)^{(3/2)} + C$ <p>(25%)</p> <p>Avoid frustration. Work out your answer to (d) carefully on paper and only then type it in. If you are using text entry, use the PREVIEW button to check that all your *, ^, and (,) 's are in place.</p>	<p>In order to find $\int (x + 3) \sqrt{2x - 3} \, dx$, we should use the substitution method.</p> <p>(a) Let $u = 2x - 3$ so that</p> <p>(b) $du = 2 \cdot dx$</p> <p>(c) The transformed integral is $\int 1/4 \cdot (u+9) \cdot u^{(1/2)} \, du$ (Don't forget to substitute for dx.)</p> <p>(Just enter the integrand without du. As you can see, "du" is already entered by TA!)</p> <p>(d) Finally, after resubstituting for u in terms of x and adding $+C$, the answer is</p> $\int (x + 3) \sqrt{2x - 3} \, dx = 1/10 \cdot (2x - 3)^{(5/2)} + 3/2 \cdot (2x - 3)^{(3/2)} + C$ <p>Avoid frustration. Work out your answer to (d) carefully on paper and only then type it in. If you are using text entry, use the PREVIEW button to check that all your *, ^, and (,) 's are in place.</p>



Correct

Comment:

Question 9: Score 1/1

Your response	Correct response
 <p>Find the Riemann Sum $\sum_{i=1}^n f(z_i) \cdot \Delta x_i =$ for the</p>	 <p>Find the Riemann Sum $\sum_{i=1}^n f(z_i) \cdot \Delta x_i =$ for the</p>



Correct

function $y = x^2 + x + 1$ between $a = 0$ and $b = 3$. Use 3 equal subintervals and **RIGHT ENDPPOINTS** (so that $z_i = x_i$.)

(a) Subinterval length $\Delta x_i = \frac{b - a}{n} = 1$ (25%)

(b) $z_i = i$ (25%)

(c) $f(z_i) = i^2 + i + 1$ (25%)

(d) The Riemann Sum $\sum_{i=1}^n f(z_i) \cdot \Delta x_i = 23$ (25%)

function $y = x^2 + x + 1$ between $a = 0$ and $b = 3$. Use 3 equal subintervals and **RIGHT ENDPPOINTS** (so that $z_i = x_i$.)

(a) Subinterval length $\Delta x_i = \frac{b - a}{n} = 1$

(b) $z_i = i$

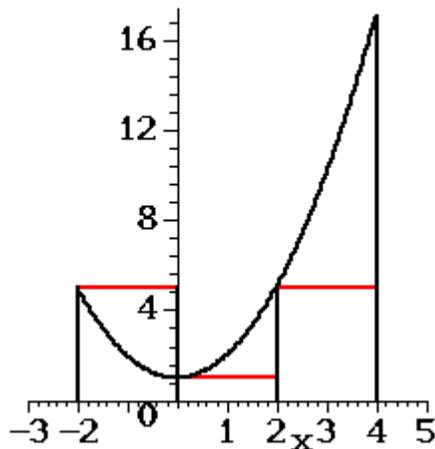
(c) $f(z_i) = i^2 + i + 1$

(d) The Riemann Sum $\sum_{i=1}^n f(z_i) \cdot \Delta x_i = 23$

Comment:

Question 10: Score 1/1

Your response	Correct response
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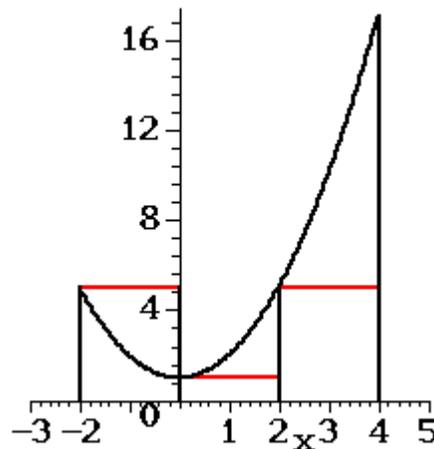


Find the Riemann Sum $\sum_{i=1}^n f(z_i) \cdot \Delta x_i =$ for the

function $y = x^2 + 1$ between $a = -2$ and $b = 4$. Use 3 equal subintervals and **LEFT ENDPPOINTS**(so that $z_i = x_{i-1}$.)

(a) Subinterval length $\Delta x_i = \frac{b - a}{n} = 2$ (25%)

(b) $z_i = (-2) + ((4) - (-2)) / 3 * (i-1)$ (25%)



Find the Riemann Sum $\sum_{i=1}^n f(z_i) \cdot \Delta x_i =$ for the

function $y = x^2 + 1$ between $a = -2$ and $b = 4$. Use 3 equal subintervals and **LEFT ENDPPOINTS**(so that $z_i = x_{i-1}$.)

(a) Subinterval length $\Delta x_i = \frac{b - a}{n} = 2$

(b) $z_i = (-2) + ((4) - (-2)) / 3 * (i-1)$



Correct

(c) $f(z_i) = (-4+2*i)^2+1$ (25%)

(c) $f(z_i) = (-4+2*i)^2+1$

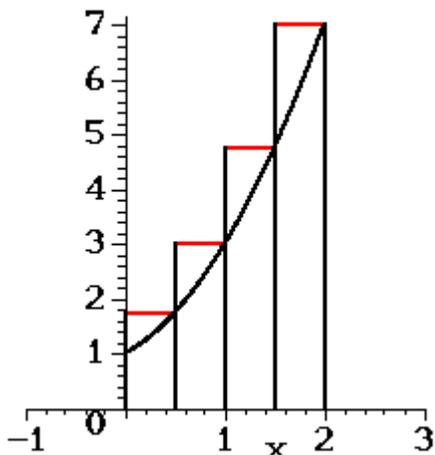
(c) The Riemann Sum $\sum_{i=1}^n f(z_i) \cdot \Delta x_i = 22$ (25%)

(c) The Riemann Sum $\sum_{i=1}^n f(z_i) \cdot \Delta x_i = 22$

Comment:

Question 11: Score 1/1

Your response	Correct response
---------------	------------------



Find the Riemann Sum $\sum_{i=1}^n f(z_i) \cdot \Delta x_i =$ for the

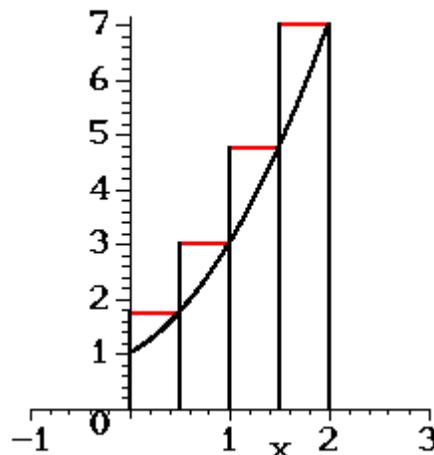
function $y = x^2 + x + 1$ between $a = 0$ and $b = 2$. Use 4 equal subintervals and **RIGHT ENDPPOINTS** (so that $z_i = x_i$.)

(a) Subinterval length $\Delta x_i = \frac{b-a}{n} = 1/2$ (25%)

(b) $z_i = 1/2*i$ (25%)

(c) $f(z_i) = 1/4*i^2+1/2*i+1$ (25%)

(d) The Riemann Sum $\sum_{i=1}^n f(z_i) \cdot \Delta x_i = 33/4$ (25%)



Find the Riemann Sum $\sum_{i=1}^n f(z_i) \cdot \Delta x_i =$ for the

function $y = x^2 + x + 1$ between $a = 0$ and $b = 2$. Use 4 equal subintervals and **RIGHT ENDPPOINTS** (so that $z_i = x_i$.)

(a) Subinterval length $\Delta x_i = \frac{b-a}{n} = 1/2$

(b) $z_i = 1/2*i$

(c) $f(z_i) = 1/4*i^2+1/2*i+1$

(d) The Riemann Sum $\sum_{i=1}^n f(z_i) \cdot \Delta x_i = 33/4$



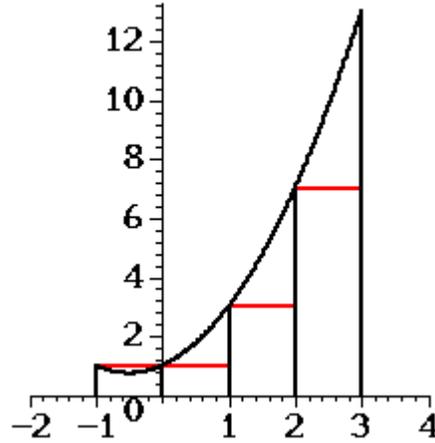
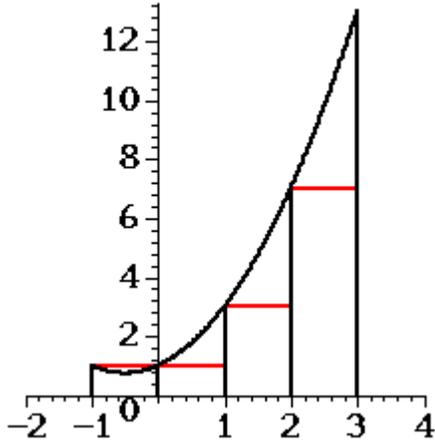
Correct

Comment:

Question 12: Score 1/1

Your response

Correct response



Find the Riemann Sum $\sum_{i=1}^n f(z_i) \cdot \Delta x_i =$ for the

function $y = x^2 + x + 1$ between $a = -1$ and $b = 3$. Use 4 equal subintervals and **LEFT ENDPOINTS** (so that $z_i = x_{i-1}$.)

(a) Subinterval length $\Delta x_i = \frac{b-a}{n} = 1$ (25%)

(b) $z_i = -2+i$ (25%)

(c) $f(z_i) = (-2+i)^2 - 1 + i$ (25%)

(d) The Riemann Sum $\sum_{i=1}^n f(z_i) \cdot \Delta x_i = 12$ (25%)

Find the Riemann Sum $\sum_{i=1}^n f(z_i) \cdot \Delta x_i =$ for the

function $y = x^2 + x + 1$ between $a = -1$ and $b = 3$. Use 4 equal subintervals and **LEFT ENDPOINTS** (so that $z_i = x_{i-1}$.)

(a) Subinterval length $\Delta x_i = \frac{b-a}{n} = 1$

(b) $z_i = -2+i$

(c) $f(z_i) = (-2+i)^2 - 1 + i$

(d) The Riemann Sum $\sum_{i=1}^n f(z_i) \cdot \Delta x_i = 12$



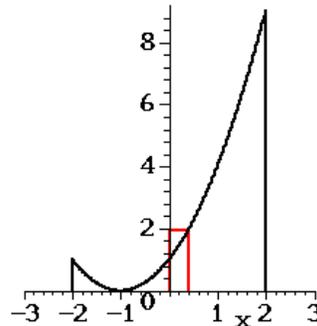
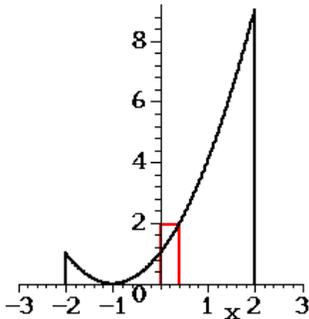
Correct

Comment:

Question 13: Score 1/1

Your response

Correct response



Evaluate the definite integral $\int_{-2}^2 x^2 + 2x + 1$

Evaluate the definite integral $\int_{-2}^2 x^2 + 2x + 1$

$dx = \lim_{n \rightarrow \infty} \left(\sum_{i=1}^n f(z_i) \Delta x_i \right)$, using n equal subintervals and **RIGHT ENDPOINTS** (so that $z_i = x_i$.)

$dx = \lim_{n \rightarrow \infty} \left(\sum_{i=1}^n f(z_i) \Delta x_i \right)$, using n equal subintervals and **RIGHT ENDPOINTS** (so that $z_i = x_i$.)

(a) The subinterval length is $\Delta x_i = \frac{b-a}{n} = \frac{4}{n}$ (25%)

(a) The subinterval length is $\Delta x_i = \frac{b-a}{n} = \frac{4}{n}$

(b) $z_i = -2 + 4/n \cdot i$ (25%)

(b) $z_i = -2 + 4/n \cdot i$

(c) The general term in the Riemann

(c) The general term in the Riemann

Sum $f(z_i) \Delta x_i = 4 \cdot \left((-2 + 4 \cdot i/n)^2 - 3 + 8 \cdot i/n \right) / n$ (25%)

Sum $f(z_i) \Delta x_i = 4 \cdot \left((-2 + 4 \cdot i/n)^2 - 3 + 8 \cdot i/n \right) / n$

(d) Now, using $\sum_{i=1}^n c = n \cdot c$, $\sum_{i=1}^n i = \frac{n \cdot (n+1)}{2}$

(d) Now, using $\sum_{i=1}^n c = n \cdot c$, $\sum_{i=1}^n i = \frac{n \cdot (n+1)}{2}$

$$\sum_{i=1}^n i^2 = \frac{n \cdot (n+1) \cdot (2 \cdot n + 1)}{6}$$

$$\sum_{i=1}^n i^2 = \frac{n \cdot (n+1) \cdot (2 \cdot n + 1)}{6}$$

and then taking the limit as $n \rightarrow \infty$, find the exact value

and then taking the limit as $n \rightarrow \infty$, find the exact value

$$\text{of } \int_{-2}^2 x^2 + 2x + 1 dx = \lim_{n \rightarrow \infty} \left(\sum_{i=1}^n f(z_i) \Delta x_i \right).$$

$$\text{of } \int_{-2}^2 x^2 + 2x + 1 dx = \lim_{n \rightarrow \infty} \left(\sum_{i=1}^n f(z_i) \Delta x_i \right).$$

28/3 (25%)

28/3



Correct

Test 10: Definite Integrals and Area

Question 1: Score 1/1

Find $\frac{d}{dx} \left(\int_{\cos(x)}^{\sin(x)} (x^3 - 2) dx \right)$.



Correct

Your Answer: $(\sin(x)^3 - 2) \cos(x) + (\cos(x)^3 - 2) \sin(x)$

Correct Answer: $(\sin(x)^3 - 2) \cos(x) + (\cos(x)^3 - 2) \sin(x)$

Remember $\frac{d}{dx} \left(\int_{Bottom(x)}^{Top(x)} f(x) dx \right) = f(Top(x)) \cdot Top'(x) - f(Bottom(x)) \cdot Bottom'(x)$.

Comment:

In our case $\frac{d}{dx} \left(\int_{\cos(x)}^{\sin(x)} (x^3 - 2) dx \right) = ((\sin(x))^3 - 2) \cos(x) + ((\cos(x))^3 - 2) \sin(x)$.

Question 2: Score 1/1

Click beside each true statement.

Choice	Selected	✓/✗	Points
$\int_a^b f(x) dx = \int_a^b f(t) dt$	Yes	✓	+1
When evaluating a DEFINITE INTEGRAL, we do NOT have to add $+ C$.	Yes	✓	+1
$\lim_{\ P\ \rightarrow 0} \sum_{i=1}^n F'(z_i) \cdot \Delta x_i = \int_a^b F'(x) dx = F(b) - F(a)$	Yes	✓	+1
$\int_a^b f(x) dx$ always measures the area between $y = f(x)$ and the x axis between $x = a$ and $x = b$.	No		
$\lim_{\ P\ \rightarrow 0} \sum_{i=1}^n f(z_i) \cdot \Delta x_i = \int_a^b f(x) dx = f(b) - f(a)$	No		
$\int f(x) dx = \int f(t) dt + C$	No		

Correct

Question 3: Score 1/1

Click beside each true statement.

Choice	Selected	<input checked="" type="checkbox"/> / <input type="checkbox"/>	Points
if f is continuous, then $\int_a^b f(x) dx$ exists.	Yes	<input checked="" type="checkbox"/>	+1
if $f(x) \leq g(x)$ then $\int_a^b f(x) dx \leq \int_a^b g(x) dx$.	Yes	<input checked="" type="checkbox"/>	+1
$\int_a^b k dx = k \cdot (b - a)$	Yes	<input checked="" type="checkbox"/>	+1
if $f(x) \leq g(x)$ then $\frac{d(f(x))}{dx} \leq \frac{d(g(x))}{dx}$.	No	<input type="checkbox"/>	
$\int_a^a f(x) dx = 0$	Yes	<input checked="" type="checkbox"/>	+1
$\int_a^b f(x) dx = \int_a^c f(x) dx + \int_c^b f(x) dx$	Yes	<input checked="" type="checkbox"/>	+1
$\int_a^b f(x) dx = - \int_b^a f(x) dx$	Yes	<input checked="" type="checkbox"/>	+1
If $\int_a^b f(x) dx$ exists, then f is differentiable.	No	<input type="checkbox"/>	

Correct

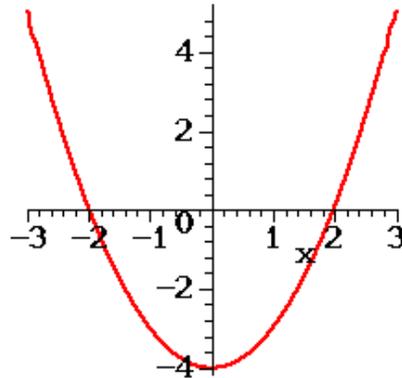
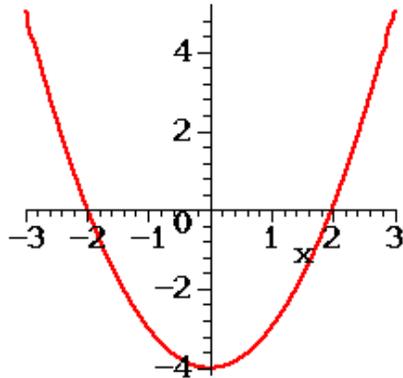
Question 4: Score 1/1

Your response

Correct response

Below is the graph of $y = x^2 - 4$.

Below is the graph of $y = x^2 - 4$.



(a) The integral which gives the area bounded by $y = x^2 - 4$ and the x -axis from $x = -2$ to $x = 2$ is

(a) The integral which gives the area bounded by $y = x^2 - 4$ and the x -axis from $x = -2$ to $x = 2$ is

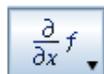


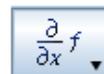
$$\int_{-2}^2 -(x^2 - 4) dx \quad (50\%)$$

$$\int_{-2}^2 -(x^2 - 4) dx$$

(Right click on the equation editor, select

(Right click on the equation editor, select


 and then
 
 to enter the integral)


 and then
 
 to enter the integral)

(b) Now find the area.

(b) Now find the area.

32/3 (50%)

32/3

Comment:

Since $y = x^2 - 4$ is below the x -axis, we must integrate $-(x^2 - 4)$ to obtain the area.

$$\text{Area} = \int_{-2}^2 (-x^2 + 4) dx = -\frac{1}{3}x^3 + 4x \Big|_{-2}^2 = 16/3 - (-16/3) = 32/3$$

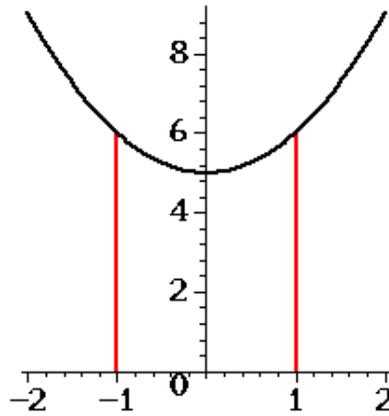
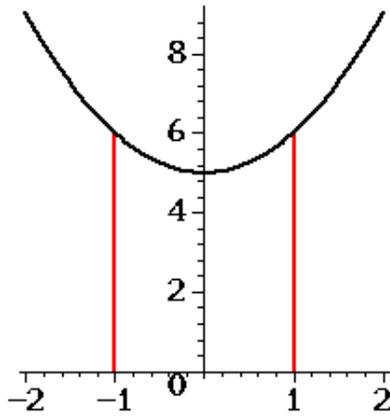
Question 5: Score 1/1

Your response

Correct response

Below is the graph of $y = x^2 + 5$.

Below is the graph of $y = x^2 + 5$.



(a) The integral which gives the area bounded by $y = x^2 + 5$ and the x axis from $x = -1$ to $x = 1$ is

(a) The integral which gives the area bounded by $y = x^2 + 5$ and the x axis from $x = -1$ to $x = 1$ is

$$\int_{-1}^1 x^2 + 5 \, dx \text{ (50\%)}$$

$$\int_{-1}^1 x^2 + 5 \, dx$$

(Right click in the equation editor, select

(Right click in the equation editor, select

and then to enter the integral)

and then to enter the integral)

(b) Now find the area.

(b) Now find the area.

32/3 (50%)

32/3

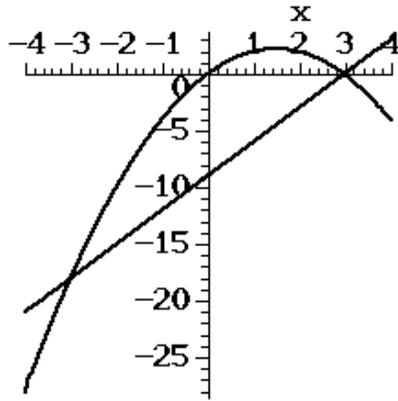


Correct

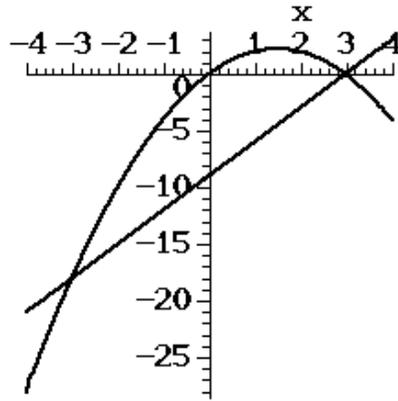
Question 6: Score 1/1

Your response	Correct response
---------------	------------------

Below is the graph of $y = 3x - x^2$ and $y = 3x - 9$.



Below is the graph of $y = 3x - x^2$ and $y = 3x - 9$.



(a) Find the intersection points of $y = 3x - x^2$ and $y = 3x - 9$, entering the point with the smaller x value first.

(-3, -18) (25%), **(3, 0)** (25%)

(a) Find the intersection points of $y = 3x - x^2$ and $y = 3x - 9$, entering the point with the smaller x value first.

(-3, -18), **(3, 0)**



Correct

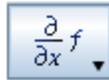
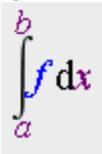
(b) The integral which gives the area bounded by $y = 3x - x^2$ and $y = 3x - 9$ is

$$\int_{-3}^3 (3x - x^2) - (3x - 9) dx \text{ (25\%)}$$

(b) The integral which gives the area bounded by $y = 3x - x^2$ and $y = 3x - 9$ is

$$\int_{-3}^3 (3x - x^2) - (3x - 9) dx$$

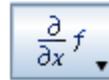
(Right click on the equation editor, select


 and then
 
 to enter the integral.)

(c) Now find the area.

36 (25%)

(Right click on the equation editor, select


 and then
 
 to enter the integral.)

(c) Now find the area.

36

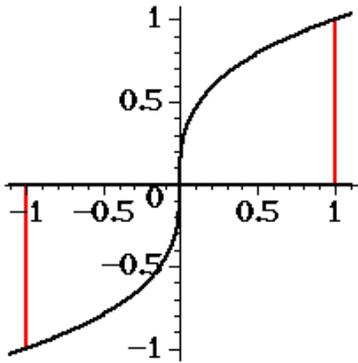
Comment:

Here the parabola is above the line, so we must integrate the parabola minus the line.

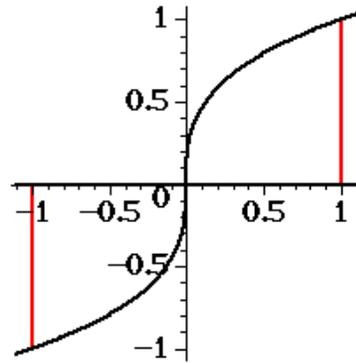
Question 7: Score 1/1

Your response	Correct response
---------------	------------------

Below is the graph of $y = x^{\frac{1}{3}}$ and $y = 0$.



Below is the graph of $y = x^{\frac{1}{3}}$ and $y = 0$.



(a) The area bounded by $y = x^{\frac{1}{3}}$ and $y = 0$ is given by the sum of these two integrals. (Enter the integral with the smaller bounds of integration first.)

$$\int_{-1}^0 -x^{\frac{1}{3}} dx \text{ (33\%)}$$

$$\int_0^1 x^{\frac{1}{3}} dx \text{ (33\%)}$$

(a) The area bounded by $y = x^{\frac{1}{3}}$ and $y = 0$ is given by the sum of these two integrals. (Enter the integral with the smaller bounds of integration first.)

$$\int_{-1}^0 -x^{\frac{1}{3}} dx$$

$$\int_0^1 x^{\frac{1}{3}} dx$$



Correct

(Right click on the equation editor, select

and then $\int_a^b f dx$ to enter the integral)

(b) Now find the area.

3/2 (33%)

(Right click on the equation editor, select

and then $\int_a^b f dx$ to enter the integral)

(b) Now find the area.

3/2

Comment:

From $x = -1$ to $x = 0$ $y = 0$ is above $y = x^{\frac{1}{3}}$, meaning we must integrate $-x^{\frac{1}{3}}$.

From $x = 0$ to $x = 1$ $y = x^{\frac{1}{3}}$ is above $y = 0$, meaning we must integrate $x^{\frac{1}{3}}$.

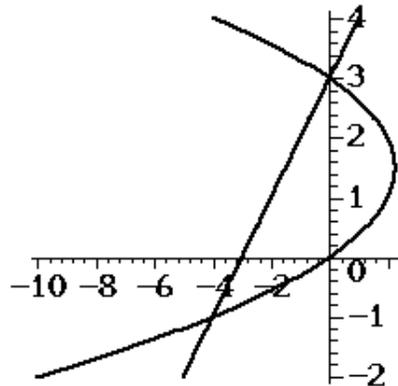
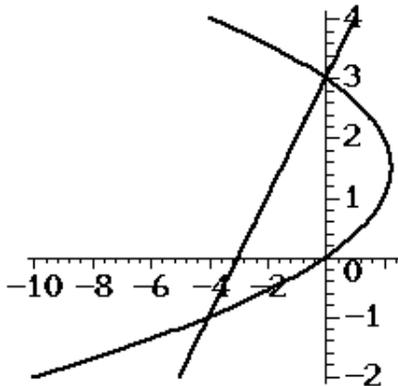
Question 8: Score 1/1

Your response

Correct response

Below is the graph of $x = 3y - y^2$ and $x = y - 3$.

Below is the graph of $x = 3y - y^2$ and $x = y - 3$.



(a) Find the intersection points of $x = 3y - y^2$ and $x = y - 3$, entering the point with the smaller x value first.

(-4, -1) (25%), **(0, 3)** (25%)

(b) The integral **IN TERMS OF** y which gives the area bounded by $x = 3y - y^2$ and $x = y - 3$ is

$$\int_{-1}^3 2y - y^2 + 3 dy \text{ (25\%)}$$

(a) Find the intersection points of $x = 3y - y^2$ and $x = y - 3$, entering the point with the smaller x value first.

(-4, -1), **(0, 3)**

(b) The integral **IN TERMS OF** y which gives the area bounded by $x = 3y - y^2$ and $x = y - 3$ is

$$\int_{-1}^3 2y - y^2 + 3 dy$$



Correct

(Right click on the equation editor, select

$\frac{\partial}{\partial x} f$ and then $\int_a^b f dx$ to enter the integral)

(c) Now find the area.

32/3 (25%)

(Right click on the equation editor, select

$\frac{\partial}{\partial x} f$ and then $\int_a^b f dx$ to enter the integral)

(c) Now find the area.

32/3

Comment:

Did you flip the x and y values when finding the intersection points? Remember, here you are finding the y values **FIRST** and then substituting to find x .

Here the parabola has the larger x values, meaning we must integrate parabola minus line: $(3y - y^2) - (y - 3)$.

Test 11: Logs and Exponents

Question 1: Score 1/1

Click beside each TRUE statement.

Choice	Selected	✓/✗	Points
$\lim_{h \rightarrow 0} (1 + h)^{\frac{1}{h}} = e$	Yes	✓	+1
$\frac{d(b^x)}{dx} = \lim_{h \rightarrow 0} \frac{(b^{h+1} - b^x)}{h} \cdot b^x$	Yes	✓	+1
$\frac{d(\ln(x))}{dx} = \frac{1}{x}$	Yes	✓	+1
$\lim_{n \rightarrow \infty} \left(1 + \frac{1}{n}\right)^n = e$	Yes	✓	+1
$\frac{d(b^x)}{dx} = \ln(b) \cdot b^x$	Yes	✓	+1



Correct

Number of available correct choices: 5

[Partial Grading Explained](#)

Comment:

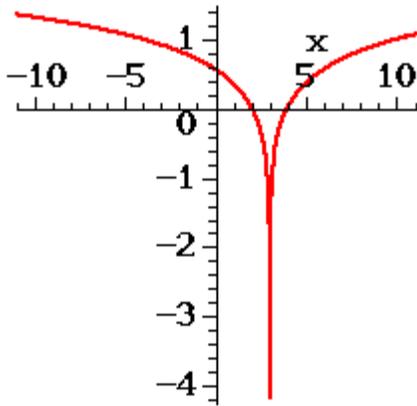
Question 2: Score 1/1

Your response	Correct response
<p>(a) Find the domain and range of $y = \log_7(3 - x)$.</p> <p>(Use interval notation. Enter infinity for ∞ and U for union.)</p> <p>Domain= $(-\infty, 3) \cup (3, \infty)$ (33%)</p> <p>Range= $(-\infty, \infty)$ (33%)</p> <p>(b) $y = \log_7(3 - x)$ has a vertical asymptote of $x=3$. (33%)</p>	<p>(a) Find the domain and range of $y = \log_7(3 - x)$.</p> <p>(Use interval notation. Enter infinity for ∞ and U for union.)</p> <p>Domain= $(-\infty, 3) \cup (3, \infty)$</p> <p>Range= $(-\infty, \infty)$</p> <p>(b) $y = \log_7(3 - x)$ has a vertical asymptote of $x=3$.</p>



Correct

Comment:



Does your answer for domain and range match the graph?

Question 3: Score 1/1

Your response	Correct response
(a) Change $\log_8(x)$ from base 8 to base 20. (Enter $\log[b](x)$ for $\log_b(x)$.) $1/3 * \ln(x) / \ln(2)$ (50%)	(a) Change $\log_8(x)$ from base 8 to base 20. (Enter $\log[b](x)$ for $\log_b(x)$.) $1/3 * \ln(x) / \ln(2)$
(b) Change $\log_8(20)$ from base 8 to base 20. $1/3 / \ln(2) * \ln(20)$ (50%)	(b) Change $\log_8(20)$ from base 8 to base 20. $1/3 / \ln(2) * \ln(20)$



Correct

Comment:

Question 4: Score 1/1

Simplify: $\log_{12}(12^{\cos(x)})$



Correct

Your Answer: $\cos(x)$

Correct Answer: $\cos(x)$

Comment: Remember $\log_a(a^{f(x)}) = f(x)$

Question 5: Score 1/1

Simplify: $9^{x^4 \log_9(\tan(x))}$



Correct

Your Answer: $\tan(x)^{(x^4)}$

Correct Answer: $\tan(x)^{(x^4)}$

$$9^{x^4 \log_9(\tan(x))}$$

Comment:
$$= 9^{\log_9(\tan(x)^{x^4})}$$
$$= (\tan(x))^{x^4}$$

Question 6: Score 1/1

Given $y = \ln(-3x)$, find $\frac{dy}{dx}$. (Enter $\exp(x)$ for e^x .)



Correct

Your Answer: $1/x$

Correct Answer: $1/x$

Comment:

Question 7: Score 1/1

Find $\int e^{2x} dx$.



Correct

Your Answer: $1/2 * \exp(2*x) + C$

Correct Answer: $1/2 * \exp(2*x) + C$

Comment:

Question 8: Score 1/1

Find $\int e^x e^{(e^x)} dx$.

HINT: This question is an example of **THE CHAIN RULE IN REVERSE**, with no "adjustments" needed.

$$\int g'(x) f'(g(x)) dx = f(g(x)) + C \quad \int g'(x) f'(g(x)) dx = f(g(x)) + C$$



Correct

This question involves "ln". Use "abs" for absolute value only if it is really necessary.

Your Answer: $\exp(\exp(x)) + C$

Correct Answer: $\exp(\exp(x)) + C$

Comment: Note e^x is the derivative of e^x . Now do you see the chain rule in reverse?

Question 9: Score 1/1

Find $\int e^{(4x)} \csc^2(e^{(4x)} + 6) dx$.

HINT: This question is an example of **THE CHAIN RULE IN REVERSE**, but you will need to adjust the integrand with a **MULTIPLICATIVE CONSTANT!** For example,

$$\int x^2(x^3 + 1)^{\frac{3}{4}} dx = \frac{1}{3} \int (3 \cdot x^2)(x^3 + 1)^{\frac{3}{4}} dx = \frac{1}{3} \frac{(x^3 + 1)^{\frac{7}{4}}}{\left(\frac{7}{4}\right)} + C = \frac{4}{21}(x^3 + 1)^{\frac{7}{4}} + C$$



Correct

Your Answer: $-1/4*\cot(\exp(4*x)+6)+C$

Correct Answer: $-1/4*\cot(\exp(4*x)+6)+C$

Comment: Note that $4 e^{(4x)}$ is the derivative of $e^{(4x)} + 6$. Now do you see the chain rule in reverse?

Question 10: Score 1/1

Find $\int \frac{4 \ln(4x + 6)^6}{4x + 6} dx$.

HINT: This question is an example of **THE CHAIN RULE IN REVERSE**, with no "adjustments" needed.

$$\int g'(x)f'(g(x)) dx = f(g(x)) + C.$$



Correct

Your Answer: $1/7*\ln(4*x+6)^7+C$

Correct Answer: $1/7*\ln(4*x+6)^7+C$

Comment: Note that $\frac{4}{4x + 6}$ is the derivative of $\ln(4x + 6)$. Now do you see the chain rule in reverse?

Question 11: Score 1/1

Given $y = (\ln(10x))^{\tan(x)}$, find $\frac{dy}{dx}$.

Hint: Use Log differentiation. If $y = F(x)^{G(x)}$, write your answer as either

$$\frac{dy}{dx} = y \cdot \left(\frac{G'(x) \cdot F'(x)}{F(x)} + \ln(F(x)) \cdot G'(x) \right) \text{ or } \frac{dy}{dx} = F(x)^{G(x)} \cdot \left(\frac{G'(x) \cdot F'(x)}{F(x)} + \ln(F(x)) \cdot G'(x) \right)$$



Correct

Do not simplify (unless you really want to!)

Your Answer: $y*(\tan(x)/x/\ln(10*x)+\ln(\ln(10*x))*(1+\tan(x)^2))$

Correct Answer: $y*(\tan(x)/x/\ln(10*x)+\ln(\ln(10*x))*(1+\tan(x)^2))$ or

Answer: $\ln(10*x)^{\tan(x)}*(\tan(x)/x/\ln(10*x)+\ln(\ln(10*x))*(1+\tan(x)^2))$

$$y = (\ln(10x))^{\tan(x)}$$

$$\ln(y) = \ln((\ln(10x))^{\tan(x)})$$

$$\ln(y) = \tan(x) \ln(\ln(10x))$$

Differentiating both sides we obtain,

Comment:
$$\frac{1}{y} \cdot y' = \tan(x) \frac{\frac{10}{x}}{\ln(10x)} + \ln(\ln(10x)) (\sec(x))^2$$

$$y' = y \left(\tan(x) \frac{\frac{10}{x}}{\ln(10x)} + \ln(\ln(10x)) (\sec(x))^2 \right)$$

$$= (\ln(10x))^{\tan(x)} \left(\tan(x) \frac{\frac{10}{x}}{\ln(10x)} + \ln(\ln(10x)) (\sec(x))^2 \right)$$

Question 12: Score 1/1

Given $y = \ln\left(\frac{\tan(x) \cos(7x)}{x^7 - 6}\right)$, find $\frac{dy}{dx}$.



Correct

Hint: Use log differentiation. Do not simplify your answer (unless you really want to!)

Your Answer: $(1+\tan(x)^2)/\tan(x)-7*\sin(7*x)/\cos(7*x)-7*x^6/(x^7-6)$

Correct Answer: $(1+\tan(x)^2)/\tan(x)-7*\sin(7*x)/\cos(7*x)-7*x^6/(x^7-6)$

$$y = \ln\left(\frac{\tan(x) \cos(7x)}{x^7 - 6}\right)$$

Comment: $y = \ln(\tan(x)) + \ln(\cos(7x)) - \ln(x^7 - 6)$

$$y' = \frac{1 + \tan^2 x}{\tan(x)} - 7 \frac{\sin(7x)}{\cos(7x)} - 7 \frac{x^6}{x^7 - 6}$$