sec2.2.5.mws

Essential Maple 7

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Chapter 2: Useful one-word commands

Section 2.2: Solving equations

Session 2.2.5: Linear equations

```
> restart;
```

```
> with(LinearAlgebra):
```

```
> Yee := Matrix( 8,8,
[[e^(-1), e^(-1), e^(-1), e^(-1), e^(-1), e^(-1), e^(-1), 0],
[1, 1, 1, 1, 1, 1, 0, 1],
[1, 1, 1, 1, 1, 0, 1, 1],
[1, 1, 1, 1, 0, 1, 1, 1],
[1, 1, 1, 0, 1, 1, 1, 1],
[1, 1, 0, 1, 1, 1, 1, 1],
[1, 0, 1, 1, 1, 1, 1, 1],
[0, e, e, e, e, e, e, e]]);
```

$$Yee := \begin{bmatrix} \frac{1}{e} & \frac{1}{e} & \frac{1}{e} & \frac{1}{e} & \frac{1}{e} & \frac{1}{e} & \frac{1}{e} & 0 \\ 1 & 1 & 1 & 1 & 1 & 1 & 0 & 1 \\ 1 & 1 & 1 & 1 & 1 & 0 & 1 & 1 \\ 1 & 1 & 1 & 1 & 0 & 1 & 1 & 1 \\ 1 & 1 & 1 & 0 & 1 & 1 & 1 & 1 \\ 1 & 1 & 0 & 1 & 1 & 1 & 1 & 1 \\ 1 & 0 & 1 & 1 & 1 & 1 & 1 & 1 \\ 0 & e & e & e & e & e & e & e \end{bmatrix}$$

```
> P,L,U,R,det := LUDecomposition(Yee,output=['P','L','U1','R','determinant']):
```

```
> Norm(Yee-P.L.U.R ,infinity);
```

$$0$$

```
> det;
```

$$-7$$

```
> P;
```

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 \end{bmatrix}$$

> **L;**

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ e & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ e & 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ e & 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ e & 0 & 0 & 0 & 1 & 0 & 0 & 0 \\ e & 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ e & 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & -e & -e & -e & -e & -e & -e & 1 \end{bmatrix}$$

> **U;**

$$\begin{bmatrix} \frac{1}{e} & \frac{1}{e} & \frac{1}{e} & \frac{1}{e} & \frac{1}{e} & \frac{1}{e} & \frac{1}{e} & 0 \\ 0 & -1 & 0 & 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & -1 & 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & -1 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & -1 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 & -1 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 & 0 & -1 & 1 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 7e \end{bmatrix}$$

> **L^(-1);**

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -e & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ -e & 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ -e & 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ -e & 0 & 0 & 0 & 1 & 0 & 0 & 0 \\ -e & 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ -e & 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ -6e^2 & e & e & e & e & e & e & 1 \end{bmatrix}$$

> **U^(-1);**

$$\begin{bmatrix} e & 1 & 1 & 1 & 1 & 1 & 1 & -\frac{6}{7}\frac{1}{e} \\ 0 & -1 & 0 & 0 & 0 & 0 & 0 & \frac{1}{7}\frac{1}{e} \\ 0 & 0 & -1 & 0 & 0 & 0 & 0 & \frac{1}{7}\frac{1}{e} \\ 0 & 0 & 0 & -1 & 0 & 0 & 0 & \frac{1}{7}\frac{1}{e} \\ 0 & 0 & 0 & 0 & -1 & 0 & 0 & \frac{1}{7}\frac{1}{e} \\ 0 & 0 & 0 & 0 & 0 & -1 & 0 & \frac{1}{7}\frac{1}{e} \\ 0 & 0 & 0 & 0 & 0 & 0 & -1 & \frac{1}{7}\frac{1}{e} \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{1}{7}\frac{1}{e} \end{bmatrix}$$

```
> P^(-1);
```

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 \end{bmatrix}$$

```
> Norm(U^(-1).L^(-1).P^(-1).Yee-IdentityMatrix(8,8),infinity);
```

$$0$$

```
>
```