



SIF5010 Matematikk 3 14.08.02

Fasit

Oppg 1 $z = 0, \pm i$

Oppg 2 a) $y = x^2(e^x - e)$
b) $y(\frac{5}{2}) \approx 25.7388$

Oppg 3 a) $y = e^x(\cos 2x - \frac{3}{2} \sin 2x)$
 $y = c_1 x + c_2 + e^x$, for $a = 0$
b) $y = c_1 e^x + c_2 e^{-x} + \frac{1}{2} x e^x$, for $a = 1$
 $y = c_1 e^{ax} + c_2 e^{-ax} + \frac{1}{1-a^2} e^x$ for $0 < a < 1$ og $1 < a$
c) $y = \sin x \ln \tan(\frac{x}{2}) + c_1 \cos x + c_2 \sin x$

Oppg 4 a) $\det A = (\alpha - 1)^2(\alpha + 2)$, $\alpha \notin \{1, -2\}$
 $\text{Null}(A) = \text{span}\{(1, 1, 0), (1, 0, -1)\}$
b) $\alpha \notin \{1, -2\}$

c) $\lambda_1 = 3$, $\mathbf{v}_1 = \begin{bmatrix} 1 \\ -1 \\ 1 \end{bmatrix}$
 $\lambda_2 = 0$, $\mathbf{v}_2 = \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix}$, $\mathbf{v}_3 = \begin{bmatrix} 1 \\ 0 \\ -1 \end{bmatrix}$
 $P = \begin{bmatrix} 1 & 1 & 1 \\ -1 & 1 & 0 \\ 1 & 0 & -1 \end{bmatrix}$, $D = \begin{bmatrix} 3 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$

Oppg 5 a) $\begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} = s \begin{bmatrix} 0 \\ 1 \\ 1 \\ 0 \end{bmatrix} + t \begin{bmatrix} -\frac{1}{2} \\ 0 \\ 0 \\ 1 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \\ 0 \\ 0 \end{bmatrix}$ $s, t, \in \mathbb{R}$
b) $\text{Null}(A) = \text{span}\{(0, 1, 1, 0), (-\frac{1}{2}, 0, 0, 1)\}$
 $\text{Col}(A) = \text{span}\{(2, 2, 4), (1, -3, -10)\}$

$$\text{Row}(\mathbf{A}) = \text{span}\{(2, 1, -1, 1), (0, 1, -1, 0)\}$$

c) $\text{Col}(\mathbf{A})^\perp = \text{span}\{(1, -3, 1)\}$

Oppg 6 a) $\lambda_1 = 0, \quad \mathbf{v}_1 = \begin{bmatrix} 1 \\ 2 \end{bmatrix} \qquad \lambda_2 = -3, \quad \mathbf{v}_2 = \begin{bmatrix} 1 \\ -1 \end{bmatrix}$

b) $\mathbf{x} = \begin{bmatrix} 10 \\ 20 \end{bmatrix} - \begin{bmatrix} 10 \\ -10 \end{bmatrix} e^{-0.06t}$