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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) $y = e^x(\cos 2x - \frac{3}{2}\sin 2x)$

b)
$$\begin{array}{ll} y = c_1 x + c_2 + e^x, & \text{for } a = 0 \\ y = c_1 e^x + c_2 e^{-x} + \frac{1}{2} x e^x, & \text{for } a = 1 \\ y = c_1 e^{ax} + c_2 e^{-ax} + \frac{1}{1-a^2} e^x & \text{for } 0 < a < 1 \text{ og } 1 < a \end{array}$$

c) $y = \sin x \ln \tan\left(\frac{x}{2}\right) + c_1 \cos x + c_2 \sin x$

Oppg 4

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

b) $\alpha \notin \{1, -2\}$

c) $\lambda_1 = 3, \quad \mathbf{v_1} = \begin{bmatrix} 1 \\ -1 \\ 1 \end{bmatrix}$

$\lambda_2 = 0, \quad \mathbf{v_2} = \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix}, \mathbf{v_3} = \begin{bmatrix} 1 \\ 0 \\ -1 \end{bmatrix}$

$$P = \begin{bmatrix} 1 & 1 & 1 \\ -1 & 1 & 0 \\ 1 & 0 & -1 \end{bmatrix}, \quad D = \begin{bmatrix} 3 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

Oppg 5

a) $$\begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} = s \begin{bmatrix} 0 \\ 1 \\ 1 \\ 0 \end{bmatrix} + t \begin{bmatrix} -\frac{1}{2} \\ 0 \\ 0 \\ 1 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \\ 0 \\ 0 \end{bmatrix} \quad s, t, \in \mathbb{R}$$

b) $\text{Null(A)} = \text{span}\{(0, 1, 1, 0), (-\frac{1}{2}, 0, 0, 1)\}$
$\text{Col(A)} = \text{span}\{(2, 2, 4), (1, -3, -10)\}$

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

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

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