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SIF5009 Matematikk 3 3.12.01

Fasit

Oppg 1

a) $y = e^t(c_1 \cos t + c_2 \sin t)$

b) $y = \frac{1}{5}e^t(-\cos t + 2\sin t) + \frac{1}{5}e^{-t}$

c) $x(t) = 10e^{\frac{1}{t}}, \quad (t \neq 0)$

d) $y = c_1e^{3t} + c_2te^{3t} + \frac{1}{2t}e^{3t}, \quad (t \neq 0)$

Oppg 2

$z_k = 2e^{i(\frac{\pi}{6}+\frac{2k\pi}{5})}, \quad k = 0, 1, 2, 3, 4$

Oppg 3

a) $$\begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} = r\mathbf{v_1} + s\mathbf{v_2} = r\begin{bmatrix} 7 \\ -3 \\ 1 \\ 0 \end{bmatrix} + s\begin{bmatrix} -9 \\ 3 \\ 0 \\ 1 \end{bmatrix} \quad r, s \in \mathbb{R}$$

b) $\text{Null(A)} = \text{Row(A)}^\perp = \text{span}\{\mathbf{v_1}, \mathbf{v_2}\}$
$\dim \text{Row(A)} = \dim \text{Col(A)} = 2$
$\text{Row(A)} = \text{span}\{(1, 0, -7, 9), (0, 1, 3, -3)\}$
$\text{Col(A)} = \text{span}\{(4, 1, 2, 1), (9, 2, 5, 1)\}$

Oppg 4

a) $\lambda_1 = 25 \quad \mathbf{v_1} = \frac{1}{\sqrt{2}}\begin{bmatrix} 1 \\ 1 \end{bmatrix}$

$\lambda_2 = 1 \quad \mathbf{v_2} = \frac{1}{\sqrt{2}}\begin{bmatrix} -1 \\ 1 \end{bmatrix}$

b) $$\mathbf{y} = c_1e^{25t}\begin{bmatrix} 1 \\ 1 \end{bmatrix} + c_2e^t\begin{bmatrix} -1 \\ 1 \end{bmatrix}$$

c) $x'^2 + \frac{1}{25}(y' + 1)^2 = 1$

Oppg 5

$$\mathbf{u_1} = \begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \end{bmatrix}, \quad \mathbf{u_2} = \begin{bmatrix} -2 \\ -1 \\ 1 \\ 2 \end{bmatrix}, \quad \mathbf{u_3} = \begin{bmatrix} 22 \\ -19 \\ -31 \\ 28 \end{bmatrix} \quad \text{(f.eks)}$$