



SIF5009 Matematikk 3 1.12.99

Fasit

Oppg 1 a) $z_0 = \sqrt[6]{2} e^{\pi i/4}; \quad z_1 = \sqrt[6]{2} e^{11\pi i/12}; \quad z_2 = \sqrt[6]{2} e^{19\pi i/12}$
b) $n = 12$

Oppg 2 a) $y = \frac{\cos x + x \sin x + C}{x^2}, \quad x > 0$
b) $y = 3e^x \cos 2x - 2e^x \sin 2x$
c) $y = c_1 e^x \cos 2x + c_2 e^x \sin 2x + \cos x + 2 \sin x$
d) $y = c_1 e^{-2x} + c_2 x e^{-2x} - e^{-2x} \ln x, \quad x > 0$

Oppg 3 $\omega = \pm 2$

Oppg 4 a) $\mathbf{x} = \begin{bmatrix} 1 \\ 0 \\ 2 \\ 0 \\ -1 \end{bmatrix} + s \begin{bmatrix} 2 \\ 1 \\ 0 \\ 0 \\ 0 \end{bmatrix} + t \begin{bmatrix} -1 \\ 0 \\ 1 \\ 1 \\ 0 \end{bmatrix}; \quad s, t \in \mathbb{R}$

Basis for $\text{Null}(A)$: $[2, 1, 0, 0, 0]^T, [-1, 0, 1, 1, 0]^T$ (f.eks.)

b) Basis for $\text{Row}(A)^\perp$: $[2, 1, 0, 0, 0]^T, [-1, 0, 1, 1, 0]^T$ (f.eks.)

Basis for $\text{Col}(A)^\perp$: $[1, 2, 1, 2]^T, [2, 1, 5, 3]^T, [2, 3, 4, -1]^T$ (f.eks.)

Oppg 5 a) Egenverdier: $-1, 1, 5$
Egenvektorer: $t \begin{bmatrix} 1 \\ 1 \\ -1 \end{bmatrix} \quad t \begin{bmatrix} 1 \\ -1 \\ 0 \end{bmatrix} \quad t \begin{bmatrix} 1 \\ 1 \\ 2 \end{bmatrix} \quad (t \neq 0)$

b) $P = \begin{bmatrix} 1/\sqrt{3} & 1/\sqrt{2} & 1/\sqrt{6} \\ 1/\sqrt{3} & -1/\sqrt{2} & 1/\sqrt{6} \\ -1/\sqrt{3} & 0 & 2/\sqrt{6} \end{bmatrix}$ (f.eks.); $D = \begin{bmatrix} -1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 5 \end{bmatrix}$

$$\mathbf{c)} \quad \mathbf{x} = c_1 e^{-t} \begin{bmatrix} 1 \\ 1 \\ -1 \end{bmatrix} + c_2 e^t \begin{bmatrix} 1 \\ -1 \\ 0 \end{bmatrix} + c_3 e^{5t} \begin{bmatrix} 1 \\ 1 \\ 2 \end{bmatrix}$$

Oppg 6 Ellipse

Oppg 7 a) Basis for $V^\perp$: $[-1, 0, 1, 0]^T$, $[0, -1, 0, 1]^T$ (f.eks.)

$$\mathbf{b)} \quad A = \begin{bmatrix} -1 & 0 & 1 & 0 \\ 0 & -1 & 0 & 1 \\ 0 & 0 & 0 & 0 \end{bmatrix} \quad (\text{f.eks.})$$