Norges teknisk–
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SIF5009 Matematikk 3 1.12.99

Fasit

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

b) $n = 12$

Oppg 2 **a)** $y = \dfrac{\cos x + x \sin x + C}{x^2}, \quad x > 0$

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 Null(A): $[2,1,0,0,0]^T$, $[-1,0,1,1,0]^T$ (f.eks.)

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

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

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

Oppg 6 Ellipse

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

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