Norges teknisk–
naturvitenskapelige universitet
Institutt for matematiske fag

SIF5009 Matematikk 3 22.12.00

Fasit

Oppg 1 **a)** $z_0 = \frac{\sqrt{3}}{2} + \frac{i}{2}$, $z_1 = -\frac{\sqrt{3}}{2} + \frac{i}{2}$, $z_2 = -i$

b) $x = \sqrt{y^2 + 1}$

Oppg 2 **a)** $y(x) = x^2 + \frac{1}{x^2}, \quad x > 0$

b) $y(\frac{5}{2}) \approx \frac{35}{6} \quad |y(\frac{5}{2}) - y_3| \approx 0.57667$

Oppg 3 **a)** $y(x) = c_1 e^x + c_2 e^{x/2} + (x^2 - 4x)e^x$

b) $y(x) = e^x(c_1 \cos x + c_2 \sin x) + e^x(\cos x \ln \cos x + x \sin x)$

Oppg 4 **a)** Betingelse: $-5a + 2b + c = 0$

$\begin{bmatrix} -5 & 2 & 1 \end{bmatrix}^T$ (f.eks)

b) $\begin{bmatrix} x_1, x_2, x_3, x_4 \end{bmatrix}^T = \begin{bmatrix} t, 1 - 2s - 2t, 1 + s, -1 + t \end{bmatrix}^T$

Basis for Null(A): $\begin{bmatrix} 0 & -2 & 1 & 0 \end{bmatrix}^T, \begin{bmatrix} 1 & -2 & 0 & 1 \end{bmatrix}^T$ (f.eks.)

c) Basis for Col(A): $\begin{bmatrix} 1 & 1 & 3 \end{bmatrix}^T, \begin{bmatrix} 1 & 2 & 1 \end{bmatrix}^T$ (f.eks.)

Basis for Row(A): $\begin{bmatrix} 1 & 1 & 2 & 1 \end{bmatrix}^T, \begin{bmatrix} 0 & 1 & 2 & 2 \end{bmatrix}^T$ (f.eks.)

Oppg 5 **a)** $\begin{bmatrix} 1 & 0 & 1 & 1 \end{bmatrix}^T, \begin{bmatrix} 0 & 1 & 0 & -1 \end{bmatrix}^T, \begin{bmatrix} 1 & 2 & 2 & 1 \end{bmatrix}^T$ (f.eks.)

b) $\begin{bmatrix} 1 & 0 & 1 & 1 \end{bmatrix}^T, \begin{bmatrix} 1 & 3 & 1 & -2 \end{bmatrix}^T, \begin{bmatrix} -4 & 3 & 1 & 3 \end{bmatrix}^T$ (f.eks.)

Oppg 6 **a)** Egenverdier: $0, -5, -6$

Egenvektorer: $\begin{bmatrix} 1 & 2 & 1 \end{bmatrix}^T, \begin{bmatrix} 1 & -3 & 1 \end{bmatrix}^T, \begin{bmatrix} 1 & 0 & -1 \end{bmatrix}^T$ (f.eks.)

$$P = \begin{bmatrix} 1 & 1 & 1 \\ 2 & -3 & 0 \\ 1 & 1 & -1 \end{bmatrix}, \quad D = \begin{bmatrix} 0 & 0 & 0 \\ 0 & -5 & 0 \\ 0 & 0 & -6 \end{bmatrix} \quad \text{(f.eks.)}$$

b) $B = \frac{1}{1000} A$

$$\mathbf{y}(t) = c_1 \begin{bmatrix} 1 \\ 2 \\ 1 \end{bmatrix} + c_2 \begin{bmatrix} 1 \\ -3 \\ 1 \end{bmatrix} e^{-t/200} + c_3 \begin{bmatrix} 1 \\ 0 \\ -1 \end{bmatrix} e^{-3t/500}$$

c) $A : 160000, \quad B : 320000, \quad C : 160000$