



NTNU

IMF

TMA4135  
Matematikk 4D

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Løsningsforslag - Øving 11

$$\boxed{1} \quad \text{Feilen} \quad \epsilon = \int_0^1 f(x) dx - J_{62}(n)$$

Vi ser at

$$|\epsilon| \leq \frac{1}{4320} \cdot 24 \cdot \left(\frac{1}{n}\right)^4$$

Feilen blir da helt sikkert mindre enn  $10^{-13}$  dersom vi har

$$\frac{1}{4320} \cdot 24 \cdot \left(\frac{1}{n}\right)^4 \leq 10^{-13}$$

$$\text{eller} \quad n \geq 485,4917727 \dots$$

$$\text{Altså} \quad \underline{\underline{n \geq 486}}$$

$$\boxed{2} \quad \begin{array}{ll} \text{Kolonne sumnormen} & \|C\|_{KSN} = \frac{9}{8} \geq 1 \\ \text{Rad sumnormen} & \|C\|_{RSN} = 1 \geq 1 \end{array}$$

Vi kan altså ikke konkludere med noe ut fra disse normene.

$$\boxed{3} \quad a) \quad L = \begin{pmatrix} 0 & 0 & 0 \\ \frac{1}{6} & 0 & 0 \\ 0 & \frac{1}{7} & 0 \end{pmatrix}$$

$$L^2 = \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ \frac{1}{42} & 0 & 0 \end{pmatrix}, \quad L^3 = 0$$

$$C = - \begin{pmatrix} 1 & 0 & 0 \\ -\frac{1}{6} & 1 & 0 \\ \frac{1}{42} & -\frac{1}{7} & 1 \end{pmatrix} \begin{pmatrix} 0 & \frac{1}{5} & 0 \\ 0 & 0 & \frac{1}{6} \\ 0 & 0 & 0 \end{pmatrix} = - \begin{pmatrix} 0 & \frac{1}{5} & 0 \\ 0 & -\frac{1}{30} & \frac{1}{6} \\ 0 & \frac{1}{210} & -\frac{1}{42} \end{pmatrix}$$

$$\|C\|_F = \sqrt{\frac{1}{25} + \frac{1}{900} + \frac{1}{(210)^2} + \frac{1}{36} + \left(\frac{1}{42}\right)^2}$$

$$\approx \underline{\underline{0.2635876667}}$$

$$b) \quad \begin{aligned} x_1^{(n+1)} &= 0 & - 0 & - \frac{1}{5} x_2^{(n)} \\ x_2^{(n+1)} &= -21/12 & - \frac{1}{6} x_1^{(n+1)} & - \frac{1}{6} x_3^{(n)} \\ x_3^{(n+1)} &= 51/14 & - \frac{1}{7} x_2^{(n+1)} & - 0 \end{aligned}$$

$x^{(0)}$	$x^{(1)}$	$x^{(2)}$	$x^{(\infty)}$
1	-0.2000000000	0.490460317	0.5
1	-2.452301587	-2.497274376	-2.5
1	3.993185941	3.999616625	4.0