

Tugas 1 komputasi numerik
kelompok B-17

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1. Berapa jumlah (dan sebutkan) bilangan angka berarti dari bilangan berikut

a. $0,84 \times 10^2 = 0,84 \rightarrow 2 \text{ angka}$
 $10^2 \rightarrow 1 \text{ angka}$

$\hookrightarrow 84 = 84$ (dibulatkan hingga 2 angka)
 \hookrightarrow angka berarti sebanyak 2 yaitu angka 8 & 4

b. $70,0 = 3 \text{ angka berarti yaitu } 7 \text{ & } 0$

c. $0,04600 = 4 \text{ angka berarti yaitu } 4, 6, \text{ dan } 2 \text{ angka } 0 \text{ dibelakang}$

d. $0,00460 = 3 \text{ angka berarti yaitu } 4, 6, \text{ dan } 1 \text{ angka } 0 \text{ dibelakang}$

e. $8,0 \times 10^3 = 8,0 \rightarrow 2 \text{ angka}$

$10^3 \rightarrow 1 \text{ angka}$
 $\hookrightarrow 8.000 \rightarrow$ angka berarti sebanyak 1 yaitu angka 8

f. $8.000 = 1 \text{ angka berarti yaitu } 8$

2. Bulatkan bilangan berikut sampai 3 angka berarti:

a. $8,755 \rightarrow 8,76$

b. $0,368124 \times 10^2 = 36,8124 \rightarrow 36,8$

c. $4.255,0002 \rightarrow 4.260$

d. $5,445 \times 10^3 = 5.445 \rightarrow 5.450$

e. $0,999500 \rightarrow 0,999500 \rightarrow 1,00$

f. $48,365 \rightarrow 48,4$

$$\begin{aligned}
 3. a. & 0,00432 + (25,1 \times 10^{-3}) + (10,322 \times 10^{-2}) \\
 & = 0,00432 + (25,1 \times 0,001) + (10,322 \times 0,01) \\
 & = 0,00432 + 0,0251 + 0,10322 \\
 & = 0,00432 + 0,0251 + 0,10322 \\
 & = ~~0,128~~ = 0,132
 \end{aligned}$$

$$\textcircled{3} \text{ b) } (4,68 \times 10^6) - (8,2 \times 10^2) = 4680000 - 820 = 4679180$$

$$\text{c) } (7,7 \times 10^{-5}) - (5,409 \times 10^{-6}) + (7,0 \times 10^{-4}) = 0,000077 - 0,000005409 + 0,00070$$

$$= 0,000077 - 0,00000541 + 0,00070 = 0,00077159 = 0,00077$$

$$\text{d) } (8,38 \times 10^5) \times (6,9 \times 10^{-5}) = 838000 \times 0,000069 = 57822 \approx 58000$$

$$\text{e) } |(8,38 \times 10^4) \times (6,90 \times 10^{-4})| = |83800 \times 0,000690| = |57822| = 57822 \approx 57800$$

$$\text{f) } [(4,68 \times 10^{-6}) - (4,45 \times 10^{-5})] / (7777 \times 10^3) + 9,6 = [0,00000468 - 0,0000445] /$$

$$7777 + 9,6 = [-0,00003982] / 7777 + 9,6 \approx [-0,0000398] / 7777 + 9,6$$

$$= -0,000000005117654622 + 9,6 \approx -0,000000005 + 9,6$$

$$= 9,599999995 \approx 9,6$$

$$\text{g) } [(4,81 \times 10^{-3}) / [(6,9134 \times 10^3) + 3226]] - 6,7845 \times 10^{-6}$$

$$= [0,00481 / [6913,4 + 3226]] - 0,0000067845$$

$$\approx [0,00481 / [6913,4 + 32,3]] - 0,0000067845$$

$$= [0,00481 / 6945,7] - 0,0000067845 \approx [0,00481 / 6946] - 0,0000067845$$

$$= 0,000000692484883386 - 0,0000067845 \approx 0,000000692 - 0,0000067845$$

$$\approx 0,000000692 - 0,00000678 = 0,0000006088$$

$$\approx -0,00000609$$

$$\text{h) } [58,6 \times (12 \times 10^{-6}) - (208 \times 10^{-6}) \times 1801] / (468,94 \times 10^{-6})$$

$$= [58,6 \times (0,000012) - (0,000208) \times 1801] / 0,00046894$$

$$= [0,0007032 - 0,374608] / 0,00046894 \approx [0,00070 - 0,37] / 0,00046894$$

$$= (-0,3693) / 0,00046894 \approx (-0,37) / 0,000469$$

$$= -788,912579957356077 \dots$$

$$\approx -790$$

1. Deret Taylor

Orde ke-0 sampai orde ke-4

Menaksir nilai $f(2)$, titik basis $x=1$

$$f(x) = e^{-x} \quad f'(x) = -e^{-x} \quad f''(x) = e^{-x} \quad f'''(x) = -e^{-x} \quad f^{(4)}(x) = e^{-x}$$

* orde ke-0

$$f(2) \approx f(1)$$

$$\approx e^{-1}$$

$$\approx 0,367879$$

$$Er = \frac{|0,135335 - 0,367879|}{0,135335} \times 100\%$$

$$= \frac{0,232544}{0,135335} \times 100\%$$

$$\approx 171,83\%$$

* orde ke-1

$$f(2) \approx f(1) + f'(1)(2-1)$$

$$\approx 0,367879 + (-e^{-1})(1)$$

$$\approx 0,367879 - 0,367879$$

$$\approx 0$$

$$Er = \frac{|0,135335 - 0|}{0,135335} \times 100\%$$

$$= \frac{0,135335}{0,135335} \times 100\%$$

$$= 100\%$$

* orde ke-2

$$f(2) \approx f(1) + f'(1)(2-1) + \frac{f''(1)}{2!} (2-1)^2$$

$$\approx 0 + \frac{e^{-1}}{2} \cdot (2-1)^2$$

$$\approx 0 + \frac{0,367879}{2} \cdot 1$$

$$\approx 0,183940$$

$$Er = \frac{|0,135335 - 0,183940|}{0,135335} \times 100\%$$

$$= \frac{0,048605}{0,135335} \times 100\%$$

$$\approx 35,91\%$$

$$f(2) = e^{-2}$$

$$\approx 0,135335$$

* orde ke-3

$$f(2) \approx f(1) + f'(1)(2-1) + \frac{f''(1)}{2!} (2-1)^2 + \frac{f'''(1)}{3!} (2-1)^3$$

$$\approx 0,183940 + \frac{(-e^{-1})}{3 \cdot 2} \cdot 1^3$$

$$\approx 0,183940 - \frac{0,367879}{6}$$

$$\approx 0,183940 - 0,061313$$

$$\approx 0,122627$$

$$Er = \frac{|0,135335 - 0,122627|}{0,135335} \times 100\%$$

$$= \frac{0,012708}{0,135335} \times 100\%$$

$$\approx 9,39\%$$

* orde ke-4

$$f(2) \approx f(1) + f'(1)(2-1) + \frac{f''(1)}{2!} (2-1)^2 + \frac{f'''(1)}{3!} (2-1)^3 + \frac{f^{(4)}(1)}{4!} (2-1)^4$$

$$\approx 0,122627 + \frac{e^{-1}}{1 \cdot 3 \cdot 2} (1)^4$$

$$\approx 0,122627 + \frac{0,367879}{24}$$

$$\approx 0,122627 + 0,015328$$

$$\approx 0,137955$$

$$Er = \frac{|0,135335 - 0,137955|}{0,135335} \times 100\%$$

$$= \frac{0,00262}{0,135335} \times 100\%$$

$$\approx 1,94\%$$

5. Deret Taylor

orde ke-0 sampai orde ke-3

menakar nilai $f(3)$, titik basis $x=2$

$$f(x) = 25x^3 - 6x^2 + 7x - 88$$

$$f'(x) = 75x^2 - 12x + 7$$

$$f''(x) = 150x - 12$$

$$f'''(x) = 150$$

$$f(3) = 25(3)^3 - 6(3)^2 + 7(3) - 88$$

$$= 25 \cdot 27 - 6 \cdot 9 + 21 - 88$$

$$= 675 - 54 + 21 - 88$$

$$= 554$$

* orde ke-0

$$f(3) \approx f(2)$$

$$\approx 25(2)^3 - 6(2)^2 + 7(2) - 88$$

$$\approx 25 \cdot 8 - 6 \cdot 4 + 14 - 88$$

$$\approx 200 - 24 + 14 - 88$$

$$\approx 102$$

$$Er = \frac{1554 - 1021}{554} \times 100\%$$

$$= \frac{452}{554} \times 100\%$$

$$\approx 81,59\%$$

* orde ke-1

$$f(3) \approx f(2) + f'(2)(3-2)$$

$$\approx 102 + (75(2)^2 - 12(2) + 7)(1)$$

$$\approx 102 + (75 \cdot 4 - 24 + 7)$$

$$\approx 102 + (300 - 24 + 7)$$

$$\approx 102 + 283$$

$$\approx 385$$

$$Er = \frac{1554 - 3851}{554} \times 100\%$$

$$= \frac{169}{554} \times 100\%$$

$$\approx 30,51\%$$

* orde ke-2

$$f(3) \approx f(2) + f'(2)(3-2) + \frac{f''(2)}{2!} (3-2)^2$$

$$\approx 385 + \frac{(150 \cdot 2 - 12)}{2} \cdot 1^2$$

$$\approx 385 + \frac{300 - 12}{2}$$

$$\approx 385 + \frac{288}{2}$$

$$\approx 385 + 144$$

$$\approx 529$$

$$Er = \frac{1554 - 5291}{554} \times 100\%$$

$$= \frac{25}{554} \times 100\%$$

$$\approx 4,51\%$$

* orde ke-3

$$f(3) \approx f(2) + f'(2)(3-2) + \frac{f''(2)}{2!} (3-2)^2 + \frac{f'''(2)}{3!} (3-2)^3$$

$$\approx 529 + \frac{150}{3 \cdot 2} \cdot 1^3$$

$$\approx 529 + \frac{150}{6}$$

$$\approx 529 + 25$$

$$\approx 554$$

$$Er = \frac{1554 - 5541}{554} \times 100\%$$

$$= \frac{0}{554} \times 100\%$$

$$= 0\%$$

6. Deret Taylor

orde ke-0 sampai orde ke-4

mencari nilai $f(4)$, titik basis $x=2$

$$f(x) = \ln x \quad f'(x) = \frac{1}{x} \quad f''(x) = -\frac{1}{x^2} \quad f'''(x) = \frac{2}{x^3} \quad f^{(4)}(x) = -\frac{6}{x^4}$$

* orde ke-0

$$\begin{aligned} f(4) &\approx f(2) \\ &\approx \ln 2 \\ &\approx 0,6931 \end{aligned}$$

$$\begin{aligned} Er &= \frac{|1,3863 - 0,6931|}{1,3863} \times 100\% \\ &= \frac{0,6932}{1,3863} \times 100\% \\ &\approx 50,00\% \end{aligned}$$

$$\begin{aligned} f(4) &= \ln 4 \\ &\approx 1,3863 \end{aligned}$$

* orde ke-1

$$\begin{aligned} f(4) &\approx f(2) + f'(2)(4-2) \\ &\approx 0,6931 + \frac{1}{2}(2) \\ &\approx 0,6931 + 1 \\ &\approx 1,6931 \end{aligned}$$

$$\begin{aligned} Er &= \frac{|1,3863 - 1,6931|}{1,3863} \times 100\% \\ &= \frac{0,3068}{1,3863} \times 100\% \\ &\approx 22,13\% \end{aligned}$$

* orde ke-2

$$\begin{aligned} f(4) &\approx f(2) + f'(2)(4-2) + \frac{f''(2)}{2!}(4-2)^2 \\ &\approx 1,6931 + \frac{-\frac{1}{2^2}}{2} \cdot 2^2 \\ &\approx 1,6931 - \frac{1}{2 \cdot 2^2} \cdot 2^2 \\ &\approx 1,6931 - 0,5 \\ &\approx 1,1931 \end{aligned}$$

$$\begin{aligned} Er &= \frac{|1,3863 - 1,1931|}{1,3863} \times 100\% \\ &= \frac{0,1932}{1,3863} \times 100\% \\ &\approx 13,94\% \end{aligned}$$

* orde ke-3

$$\begin{aligned} f(4) &\approx f(2) + f'(2)(4-2) + \frac{f''(2)}{2!}(4-2)^2 + \frac{f'''(2)}{3!}(4-2)^3 \\ &\approx 1,1931 + \frac{\frac{2}{2^3}}{3 \cdot 2} \cdot 2^3 \\ &\approx 1,1931 + \frac{2 \cdot 1}{3 \cdot 2 \cdot 2^3} \cdot 2^3 \\ &\approx 1,1931 + 0,3333 \\ &\approx 1,5264 \end{aligned}$$

$$\begin{aligned} Er &= \frac{|1,3863 - 1,5264|}{1,3863} \times 100\% \\ &= \frac{0,1401}{1,3863} \times 100\% \\ &\approx 10,11\% \end{aligned}$$

* orde ke-4

$$\begin{aligned} f(4) &\approx f(2) + f'(2)(4-2) + \frac{f''(2)}{2!}(4-2)^2 + \frac{f'''(2)}{3!}(4-2)^3 + \frac{f^{(4)}(2)}{4!}(4-2)^4 \\ &\approx 1,5264 + \frac{(-\frac{6}{2^4})}{4 \cdot 3 \cdot 2} \cdot 2^4 \\ &\approx 1,5264 - \frac{6 \cdot 1}{4 \cdot 3 \cdot 2 \cdot 2^4} \cdot 2^4 \\ &\approx 1,5264 - 0,25 \\ &\approx 1,2764 \end{aligned}$$

$$\begin{aligned} Er &= \frac{|1,3863 - 1,2764|}{1,3863} \times 100\% \\ &= \frac{0,1099}{1,3863} \times 100\% \\ &\approx 7,93\% \end{aligned}$$