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MK : Analisis Numerik
Tugas 8

1. Tentukan deret taylor dan Macluoren dari :

a) $F(x) = \frac{1}{1+x}$

taylor $\frac{1}{1+x}$ $c = 2$

$F(2) = \frac{1}{3}$

$$= \frac{1}{3} + \frac{\frac{d}{dx}\left(\frac{1}{1+x}\right)(2)}{1!}(x-2) + \frac{\frac{d^2}{dx^2}\left(\frac{1}{1+x}\right)(2)}{1!}(x-2)^2$$

$$+ \frac{\frac{d^3}{dx^3}\left(\frac{1}{1+x}\right)(2)}{3!}(x-2)^3 + \text{dst..}$$

$$\frac{d}{dx}\left(\frac{1}{1+x}\right)^{(2)} = -\frac{1}{9}$$

$$\frac{d^2}{dx^2}\left(\frac{1}{1+x}\right)^{(2)} = \frac{2}{27}$$

$$\frac{d^3}{dx^3}\left(\frac{1}{1+x}\right)^{(2)} = \frac{-2}{27}$$

$$\frac{d^4}{dx^4}\left(\frac{1}{1+x}\right)^{(2)} = \frac{8}{81}$$

$$= \frac{1}{3} + \frac{\frac{-1}{9}}{1!}(x-2) + \frac{\frac{2}{27}}{2!}(x-2)^2 + \frac{\frac{-2}{27}}{3!}(x-2)^3 + \frac{\frac{8}{81}}{4!}(x-2)^4 + \dots$$

$$= \frac{1}{3} - \frac{1}{9}(x-2) + \frac{1}{27}(x-2)^2 - \frac{1}{81}(x-2)^3 + \frac{1}{243}(x-2)^4 + \text{dst..}$$

Macluoren $a = 0$

$F(x) = \frac{1}{1+x}$ at $a = 0$

$F(0) = 1$

$$1 + \frac{\frac{d}{dx}\left(\frac{1}{1+x}\right)}{1!} x \frac{\frac{d^2}{dx^2}\left(\frac{1}{1+x}\right)^{(0)}}{2!} x^2 + \frac{\frac{d^3}{dx^3}\left(\frac{1}{1+x}\right)^{(0)}}{3!} x \frac{\frac{d^3}{dx^3}\left(\frac{1}{1+x}\right)^{(0)}}{3!} x^3$$

$\hookrightarrow$

←

$$\frac{d}{dx}\left(\frac{1}{1+x}\right)(10) = -1$$

$$\frac{d^2}{dx^2}\left(\frac{1}{1+x}\right)(0) = 2$$

$$\frac{d^3}{dx^3}\left(\frac{1}{1+x}\right)(0) = -6$$

$$\frac{d^4}{dx^4}\left(\frac{1}{1+x}\right)(0) = 24$$

$$= 1 + \frac{-1}{1!}x + \frac{2}{2!}x^2 + \frac{-6}{3!}x^3 + \frac{24}{4!}x^4 \cdots$$

$$= 1 - x + x^2 - x^3 + x^4 + \cdots$$

b) $F(x) = \ln(1+x)$

Taylor $a = 2$

$F(2) : \ln(3)$

$$= \ln(3)\ \frac{d}{dx}(\ln(4+x))^{(2)} + \frac{\frac{d^2}{dx^2}(\ln(1+x)(2)}{2!}(x-2)^2 + \frac{\frac{d^3}{dx^3}(\ln(1+x))(2)}{2!}(x)^3$$

$$= \frac{d}{dx}(\ln(1+x))(2) = \frac{1}{3}$$

$$\frac{d^2}{dx^2}(\ln(1+x))(2) = \frac{1}{9}$$

$$\frac{d^3}{dx^3}(\ln(1+x))(2) = \frac{2}{27}$$

$$\frac{d^4}{dx^4}(\ln(1+x))(2) = \frac{-2}{27}$$