(1) uraikan $F(x) = K \cdot \cos x$ disekitar $\frac{\pi}{4}$ dgn deret taylor order n

$F(x) = \cos x$ $\quad$ $F''(x) = -\cos x$ $\quad$ $F^4(x) = \cos x$

$F'(x) = -\sin x$ $\quad$ $F'''(x) = \sin x$

$\rightarrow \cos(x) = 5 \cdot \cos(\pi/4) + \frac{(\pi/4 - 0)}{1!} \cdot 5 - \sin(\pi/4) + \frac{(\pi/4 - 0)^2}{2!}$

$5 - \cos(\pi/4) + \frac{(\pi/4 - 0)^3}{3!} \cdot 5 \sin(\pi/4) + (\pi/4 - 0)^4$

$5 \cdot \cos(\pi/4)$

$= 5 \cdot \cos(45) + H \cdot 5 - \sin(45) + \frac{H^2}{2} \cdot 5 \cdot -\cos(45) + \frac{H^3}{6} \cdot$

$5 \cdot \sin(45) + \frac{H^4}{24} \cdot 5 \cdot \cos(45)$

$= 3.53553 + -4.25451\ H \cdot -2.62660\ H_2 \cdot$

$3.53553\ H_3 \cdot 3.53553\ H_4$

Kesimpulan

Cari turunannya terlebih dahulu, untuk mempermudah menguraikan cosx, terakhir tinggal dicari perkalian cos dan kenya.

Dipindai dengan CamScanner

2. $F(x) = x^2 - 3x + 1$, Tentukan akar persamaan dan metode newton dan secant (NIM ganjil) $e = 0{,}000001$

Jawab

$F(x) = x^2 - 3x + 1 \rightarrow F'(x) = 2x - 2$

$$x_{r+1} = x_r - \frac{f(x_r)}{f'(x_r)}$$

$$\rightarrow x_1 = x_0 - \frac{Fx_0}{F'(x_0)}$$

$$= 2 - \frac{(2^2 - 3.2 + 1)}{2.2 - 2} = \frac{2 - 7}{2} = 5.5$$

$$e_1 = \frac{|x_1 - x_0|}{5.5 - 2} = 3.5$$

Bandingkan $\varepsilon = 0{,}000001$

$e_1 > \varepsilon$

$$\rightarrow x_2 = x_1 - \frac{F(x)}{F'x_1}$$

$$= 3.5 - \frac{(3.5^2 - 3.3.5 + 1)}{2.2 - 2}$$

$$x_2 = \frac{3.5 - 11.5}{2} = 12.785$$

Kesimpulan

Toleransi error masih jauh mendekati 0,000001, sehingga membutuhkan komputer utk perhitungan cepatnya.

Metode Secant

$F(x)$ ~~F(x)~~ $= x^2 - 3x + 1$ Toleransi $= \varepsilon$

$x_0 = 5, x_1 = 4$

Jawab

$$x_{r+1} = x_r - \frac{F(x_r)(x_r - x_{r-1})}{f(x_r) - F(x_{r-1})}$$

$$x_2 = x_1 - \frac{F(x_1)(x_1 - x_0)}{F(x_1) - f(x_0)}$$

$$x_2 = 4 - \frac{(4^2 - 3.4 + 1)(4 - 5)}{(4^2 - 3.4 + 1) - (5^2 - 3.5 + 1)}$$

$$= 4 - \frac{(5)(-1)}{5 - 11} = 4 + \frac{5}{-6} = -3.16$$

$e_2 = |x_2 - x_1|$

$= -3.16 - 4 = -7.16$

Bandingkan $e_2 > \varepsilon$

3 Penyelesaian Eliminasi gauss

SPL → ax = b

$$\begin{bmatrix} 1 & 2 & 3 & -1 \\ 2 & 5 & 4 & 8 \\ 4 & 2 & 2 & 1 \\ 6 & 4 & -1 & -2 \end{bmatrix} \begin{bmatrix} x1 \\ x2 \\ x3 \\ x4 \end{bmatrix} = \begin{bmatrix} 10 \\ 8 \\ -2 \\ 4 \end{bmatrix} \begin{array}{l} b2 + (-2)\, b1 \\ b3 + (-2)\, b1 \\ b4 + (5)\, b1 \end{array}$$

$$\begin{bmatrix} 1 & 2 & 3 & -1 \\ 0 & 1 & -2 & 10 \\ 0 & -2 & -4 & 3 \\ 0 & 9 & 14 & -7 \end{bmatrix} \begin{bmatrix} 10 \\ -12 \\ -22 \\ 54 \end{bmatrix} \rightarrow b4 + (4)\, b3$$

$$\begin{bmatrix} 1 & 2 & 3 & -1 \\ 0 & 1 & -2 & 10 \\ 0 & -2 & -4 & 3 \\ 0 & 0 & 8 & -1 \end{bmatrix} \begin{bmatrix} 10 \\ -12 \\ -22 \\ -26 \end{bmatrix}$$

Subtitusi mundur

baris 4 → $8x_4 = -26 \rightarrow x_4 = 26$

baris 3 → $-2x_3 - x_4 = -22$

$$-2x_3 = -22 + 26$$

$$x_3 = \frac{48}{-2} = -24$$

baris 2 → $1x_2 - x_3 = -12$

$$1x_2 = -12 + 26$$

$$1x_2 = \frac{14}{-2} = -7$$

baris 1 → $1x_1 + 2x_2 + 3x_3 - x_4 = 10$

$$1x_1 = 10 - 2(2) - 3(3) + 4$$

$$x_1 = \frac{-11}{1} = -11$$

solusi $\begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix} = \begin{matrix} -11 \\ -7 \\ -24 \\ 26 \end{matrix}$