* Find The value of $f(0.6)$ by taylor series if $f(0.5) = 1$

$f'(0.5) = 2.5$, $f''(0.5) = 2$ and all other higher order derivatives

of $f(x)$ at $x = 0.5$ are zero

h stepsize

0.5 0.6

$$f(x+h) = f(x) + h(f'(x)) + \frac{h^2}{2!} f''(x)$$

$$h = 0.6 - 0.5 = 0.1$$

$$f(0.6) = f(0.5) + 0.1\, f'(0.5) + \frac{(0.1)^2}{2!} f''(0.5) = 1.26$$

* find $y(0.1)$ if $y' = -y + x + 1$, $y(0) = 1$ by using taylor series to fourth order

$$y(x+h) = y(x) + h(y'(x)) + \frac{h^2}{2!}(y''(x)) + \frac{h^3}{3!} y'''(x)$$

$h = 0.1 - 0 = 0.1$, $x_0 = 0$, $y_0 = 1$ $\rightarrow$ $y' = (-x + x + 1)$

$$y(0.1) = y(0) + 0.1 \times y'(0) + \frac{(0.1)^2}{2!} y''(0) + \frac{(0.1)^3}{3!} y'''(0)$$

$$y(0.1) = 1 + \cancel{0.1 \times (-1+0+1)} + \frac{(0.1)^2}{2!}(1) + \frac{(0.1)^3}{3!}(-1)$$

$y'' = -y' + 1 = 1$, $y''' = -y'' = -1$

$$y(0.1) = 1.0048332$$

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$f(h) = f(0) + h(f'(0)) + \frac{h^2}{2!} f''(0) + \ldots$

$f(x) = e^x$

$f(x) = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \ldots$

error

$$R_n = \frac{(x-h)^{n+1} \times f^{n+1}(c)}{(n+1)!} \qquad c \in [x, x+h]$$

*How many terms would it require to get an approximate of e^1 $(h=1)$ within amaginrude of absolute error of less Than 10^{-6}

$$R_n = \frac{(x-h)^{n+1}}{n+1!} f^{n+1}(c) \qquad c \in [x, x+h]$$

$x = 0$

$h = 1$

$0 \leq c \leq 1$

$$R_n = \frac{(-1)^{n+1}}{(n+1)!} e^c \rightarrow \frac{1}{(n+1)!} \leq |R_n| \leq \frac{e}{(n+1)!}$$

$$\frac{e}{(n+1)!} \leq 10^{-6} \xrightarrow{\boxed{\div 10^{-6}}} 10^6 e \leq (n+1)! \rightarrow 10^6 e \leq n(n+1)$$

$n \geq 9$

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→ forward elemination → Backsub.

→ number of steps : of forward elemination $(n-1)$

Solve The system by gauss elemination

$$\left[\begin{array}{ccc|c} 1 & 2 & 3 & 6 \\ 2 & -3 & 2 & 4 \\ 3 & -1 & -1 & -2 \end{array}\right] \xrightarrow[3R_1 - R_3]{2R_1 - R_2} \left[\begin{array}{ccc|c} 1 & 2 & 3 & 6 \\ 0 & 7 & 4 & 8 \\ 0 & 7 & 10 & 20 \end{array}\right] \xrightarrow{R_2 - R_3}$$

$$\left[\begin{array}{ccc|c} 1 & 2 & 3 & 6 \\ 0 & 7 & 4 & 8 \\ 0 & 0 & -6 & -12 \end{array}\right]$$

$-6Z = -12$, $Z = 2$ | $7y + 4(2) = 8$, $y = 0$ | $(X) + 2(0) +$ ..., $X = 0$

Assignment 1 :

$$\left[\begin{array}{ccc|c} 2 & -3 & 1 & 5 \\ 1 & 0 & -4 & 3 \\ 0 & 5 & 3 & 8 \end{array}\right] \xrightarrow[\frac{10}{3} R_2 - R_3]{\frac{1}{2} R_1 - R_2} \left[\begin{array}{ccc|c} 2 & -3 & 1 & 5 \\ 0 & -\frac{3}{2} & \frac{9}{2} & \frac{1}{2} \\ 0 & 0 & 18 & \frac{19}{3} \end{array}\right]$$

$18Z = \frac{19}{3}$, $\boxed{Z = \frac{19}{54}}$ | $-\frac{3}{2}(y) + \frac{9}{2}\left(\frac{19}{54}\right) = \frac{1}{2}$, $\boxed{y = 25/18}$ | $2(X) - 3\left(\frac{25}{18}\right) + \left(\frac{19}{54}\right) = 5$, $\boxed{X = \frac{179}{27}}$