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15/ENG01/008

CHEMICAL ENGINEERING

ENG382

1. $f(y) = \cos(y)$

Let $\cos y = 0$

adding y to the LHS and RHS

$$y + 0 = \cos y + y$$

$$y_{i+1} = \cos y_i + y_i$$

~~$f(y) = e^{15z} - 1 + \cos(z)$~~
 ~~$e^{15z} - z + \cos(z) = 0$~~
 ~~$f(z) = e^{15z} + \cos(z)$~~
 ~~$f(z) = e^{15z} + \cos(z)$~~

i. $y_0 = 0.05$

a. when $i = 0$

$$\begin{aligned} y_1 &= \cos(y_0) + y_0 \\ &= \cos(0.05) + 0.05 \\ &= 0.999 + 0.05 \\ &= 1.0499 \\ &\approx 1.05 \end{aligned}$$

b. when $i = 1$

$$\begin{aligned} y_2 &= \cos(y_1) + y_1 \\ &= \cos(1.0499) + 1.0499 \\ &= 0.9998 + 1.0499 \\ &= 2.0497 \end{aligned}$$

c. when $i = 2$

$$\begin{aligned} y_3 &= \cos y_2 + y_2 \\ &= \cos(2.0497) + 2.0497 \\ &= 0.9993 + 2.0497 \\ &= 3.0490 \end{aligned}$$

d. when $i = 3$

$$\begin{aligned}y_4 &= \cos y_3 + y_3 \\ &= \cos(3.0490) + 3.0490 \\ &= 0.9985 + 3.0490 \\ &= 4.0475\end{aligned}$$

e. when $i = 4$

$$\begin{aligned}y_5 &= \cos y_4 + y_4 \\ &= \cos(4.0475) + 4.0475 \\ &= 0.9975 + 4.0475 \\ &= 5.0450\end{aligned}$$

2. $f(z) = e^{-15z} - z + \cos(z)$

$$\begin{aligned}e^{-15z} - z + \cos(z) &= 0 \\ z &= e^{-15z} + \cos(z) \\ z_{i+1} &= e^{-15z_i} + \cos(z_i)\end{aligned}$$

$$z_0 = 0.1$$

when $i = 0$

$$\begin{aligned}z_1 &= e^{-15z_0} + \cos(z_0) \\ &= e^{-15(0.1)} + \cos(0.1) \\ &= 0.2231 + 0.9999 \\ z_1 &= 1.2231\end{aligned}$$

when $i = 1$

$$\begin{aligned}z_2 &= e^{-15z_1} + \cos(z_1) \\ &= e^{-15(1.2231)} + \cos(1.2231) \\ &= 1.077 \times 10^{-8} + 0.9997 \\ z_2 &= 0.9997\end{aligned}$$

when $i = 2$

$$z_3 = e^{-15z_2} + \cos(z_2)$$

$$e^{-15(0.9997)} + \cos(0.9997)$$

$$6.7480 \times 10^{-3} + 0.9998$$

$$Z_3 = 0.9998$$

when $i = 3$

$$Z_4 = e^{-15Z_3} + \cos(Z_3)$$

$$= e^{-15(0.9998)} + \cos(0.9998)$$

$$Z_4 = 0.9998$$

when $i = 4$

$$Z_5 = e^{-15Z_4} + \cos(Z_4)$$

$$= e^{-15(0.9998)} + \cos(0.9998)$$

$$= 3.0682 \times 10^{-7} + 0.9998$$

$$Z_5 = 0.9998$$