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15/ENG04/010

Electrical/Electronic Engineering

① $F(x) = e^{-0.5x} (4-x) - 2$

$$u = e^{-0.5x} \quad \frac{du}{dx} = -0.5e^{-0.5x}$$

$$v = 4-x \quad \frac{dv}{dx} = -1$$

$$\frac{dy}{dx} = u \frac{dv}{dx} + v \frac{du}{dx}$$

$$= e^{-0.5x} (-1) + (4-x) (-0.5e^{-0.5x})$$

$$= e^{-0.5x} + (-2e^{-0.5x} + 0.5xe^{-0.5x})$$

$$f(x) = -3e^{-0.5x} + 0.5xe^{-0.5x}$$

$$x_{i+1} = x_i + \frac{f(x_i)}{f'(x_i)} \quad \text{where } x_0 = 0.5$$

$$x_1 = 0.5 - \frac{e^{-0.5(0.5)} (4-0.5) - 2}{-3e^{-0.5(0.5)} + 0.5(0.5)e^{-0.5(0.5)}}$$

$$x_1 = 0.5 - \frac{0.7258}{-2.1417}$$

$$x_1 = 0.838889$$

$$x_2 = 0.838889 - \frac{e^{-0.5(0.838889)} (4-0.838889) - 2}{-3e^{-0.5(0.838889)} + 0.5(0.838889)e^{-0.5(0.838889)}}$$

$$x_2 = 0.884956$$

$$x_3 = 0.884956 - \frac{e^{-0.5(0.884956)} (4-0.884956) - 2}{-3e^{-0.5(0.884956)} + 0.5(0.884956)e^{-0.5(0.884956)}}$$

$$x_3 = 0.885709$$

$$x_4 = 0.885709 - \frac{e^{-0.5(0.885709)} (4-0.885709) - 2}{-3e^{-0.5(0.885709)} + 0.5(0.885709)e^{-0.5(0.885709)}}$$

$$x_4 = 0.885709$$

$$x_5 = 0.885709 - \frac{e^{-0.5(0.885709)} (4-0.885709) - 2}{-3e^{-0.5(0.885709)} + 0.5(0.885709)e^{-0.5(0.885709)}}$$

$$x_5 = 0.885709$$

i	x_i
0	0.5
1	0.888889
2	0.884956
3	0.885709
4	0.885709
5	0.885709

(2) $U_0 = 18, m = 3.5 \text{ kg}, g = 9.8 \text{ ms}^{-1}$
 $f_0 = \frac{0.3 V^2}{500 + (1 - \ln V)^3} - 0.02 V$

$$U = 0.3 V^2 \quad \frac{dU}{dV} = 0.6 V$$

$$V = 500 + (\ln V)^3 \quad \frac{dV}{d\lambda} = \frac{3}{V} (\ln V)^2$$

$$F\Delta = \frac{0.3 V^2 \times \frac{3}{V} (\ln V)^2 - (500 + (\ln V)^3) 0.6 - 0.02}{(500 + (\ln V)^3)^2}$$

$$F\Delta = \frac{(\ln V)^2 \left[\frac{0.9 V - 300 - 0.6 \ln V}{25 \times 10^4 + (\ln V)^4} \right] - 0.02}{(\ln V)^2}$$

$$F\Delta = \left[\frac{0.9 V - 300 - 0.6 \ln V}{25 \times 10^4 + (\ln V)^4} \right] - 0.02$$