

Assignment 4

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$F = x^2i + (3kx^2)j + \sin \pi k$ find

$$\frac{dF}{dk} \quad \frac{d^2F}{dk^2} \quad \left. \frac{dF}{dx} \right|_{\text{and}} \quad \left. \frac{d(F \cdot F)}{dx} \right|_{\text{at } x=4}$$

SOLUTION

$$F = 2xi + 3j + \cos \pi k$$

at $k=1$

$$\frac{dF}{dk} = 2(1)i + 3j + (\cos(1))k$$

$$\frac{dF}{dk} \Big|_{k=1} = 2i + 3j + 0.9998k$$

$$\frac{d^2F}{dk^2} = 2i - \sin \pi k \quad \text{at } k=1$$

$\frac{d^2F}{dk^2}$

$$\frac{d^2F}{dk^2} \Big|_{k=1} = 2i - \sin(1)k$$

$$\frac{d^2F}{dk^2} \Big|_{k=1} = 2i - 0.0175k$$

$\frac{dF}{dx}$

$$\frac{dF}{dx} = 2i + 3j + 0.998k$$

$$\frac{dF}{dx} = \sqrt{2^2 + 3^2 + (0.998)^2}$$

$$= \sqrt{13.996}$$

$$= 3.74$$

Q) d (F-1)

$$dx = kx^i + (3x+2)j + \sin xk \quad + [k^9 + (3x+2)j + \sin xk$$

$$k^4 + (9k^2 + 12k + 4) + (\sin 2x)$$

$$\frac{d}{dx} (FF) = 4k^3 + (8k+12) + 12\sin x \cos x$$

$$\frac{d}{dx} \quad \frac{d}{dx} = 1$$

$$d(F-1) = 4 + 18 + 12 + 20 \sin(1) \cos(1)$$

$$= 4 + 30 + 0.236$$

$$= 34.236$$

2) If

$$r = (t^2 + 3t)i - 2\sin 3tj + 3e^{2t}k$$

determine

a) $\frac{dr}{dt}$ b) $\frac{d^2r}{dt^2}$ c) The value of $\frac{d^2r}{dt^2}$ at $t=20$

$$\frac{dr}{dt} = (2t+3)i - 6\cos 3tj + 6e^{2t}k$$

$$\frac{dr}{dt} \quad t=0 = (2(0)+3)i - 6\cos 3(0)j + 6e^{2(0)}k$$

$$\frac{dr}{dt} \quad t=0 = 3i - 6j + 6k$$

$$\frac{d^2r}{dt^2} = 2i + 18\cos 3tj + 12e^{2t}k$$

$$\frac{d^2r}{dt^2} \quad t=0 = 2i + 18\cos 3(0)j + 12e^{2(0)}k$$

$$\frac{d^2r}{dt^2} \quad t=0 = 2i + 18(1)j + 12e^{2(0)}k$$

$$\frac{d^2r}{dt^2} \quad t=0 = 2i + 18j + 12k$$

$$= \sqrt{2^2 + 12^2}$$

$$= \sqrt{4 + 144}$$

$$= \sqrt{148}$$

$$= \sqrt{4 \times 37}$$

$$= 2\sqrt{37} .$$