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Computer Engineering

Assignment

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

a  $\frac{\partial F}{\partial x} = 2x i + 3j + \cos \pi k$

b  $\frac{\partial^2 F}{\partial x^2} = 2i - \sin \pi k$

c  $\left| \frac{\partial F}{\partial x} \right|_{at \ x=1} = 2(1)i + 3j + \cos(\pi)k$   
 $= 2i + 3j + 0.999k$   
 $= \sqrt{2^2 + 3^2 + (0.999)^2}$   
 $= \sqrt{4 + 9 + 0.998001}$   
 $= \sqrt{13.998001}$

d.  $\partial/\partial n (F \cdot F)$

$$(F \cdot F) = (2x^2 i + (3x-2)j + \sin x k - x^2 i + (3x+2)j + \sin x k)$$

$$\frac{d(\sin^2 x)}{dx} = \sin^2 x = \sin x \cdot \sin x$$

$$u = \sin x, \quad v = \sin x$$

$$\partial u/\partial x = \cos x, \quad \partial v/\partial x = \cos x$$

Using product rule

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

$$\sin x (\cos x) + \sin x (\cos x)$$

$$2 \sin x \cos x + \sin x \cos x$$

$$\sin^2 x = 2 \sin x \cos x$$

$$\frac{\partial (F \cdot F)}{\partial x} = 4x + 18x + 12 + 2 \sin \cos x$$

$$\text{at } x=1 = 4(1) + 18(1) + 12 + 2 \sin(1) \cos(1)$$

$$= 34.08$$

$$2) r = (6^2 + 3t) i - 2 \cos 3t j + 3e^{2t} k$$

$$a \frac{dr}{dt} = (12 + 3) i - 6 \sin 3t j + 6e^{2t} k$$

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

$$c \text{ at } t=0 \left( \frac{d^2r}{dt^2} \right) = 2i + 18 \cos(0) j + 12e^{2(0)} k$$

$$= 2i + 18j + 12k$$

$$= \sqrt{2^2 + 18^2} = \sqrt{4 + 324} = \sqrt{328} = 18.11$$