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Civil Engineering.

Assignment 2

Given that $f = x^2 i + (3x+2) j + \sin x k$

$\Rightarrow \frac{df}{dx} = 2x i + 3j + \cos x k$

$\Rightarrow \frac{d^2 f}{dx^2} = 2i - \sin x k$

$\left|\frac{df}{dx}\right|_{x=1} = 2(1)i + 3j + \cos(1) k = \frac{2i + \ldots}{\sqrt{2^2 + 3^2 + 1^2}}$

c) $\left|\frac{df}{dx}\right| = \sqrt{2^2 + 3^2 + \cos(1)^2} = \sqrt{4 + 9 + 0.99}$
$= \sqrt{13.99} = 1\ldots$

$= (x^2 i + (3x+2)j + \sin x$.

d) $\frac{d}{dx}(f \cdot f) = f \frac{df}{dx} + f \frac{df}{dx}$

$(x^2 i + (3x+2) j + \sin x k) \cdot (2x i + 3j + \ldots$

$(x^2 i + (3x+2) j + \sin x k) \cdot (2x i + 3j + \ldots$

$= 2x^3 + (9x+6) + (\cos x \sin x) + 2x^3 + 9x + 6 +$
$\cos x(\sin x)$

$= 4x^3 + 18x + 12 + 2\cos x \sin x$

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

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

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

~~the value~~

$\left(\frac{d^2 r}{dt^2}\right)$ at $t = 0$

$= 2i + 18\sin 3(0)i + 12e^{2(0)}k = 2i + 0j + 12k = 2i + 12k$

$= \sqrt{2^2 + 12^2} = \sqrt{4 + 144} = \sqrt{148} = 12.165$