Assignment II

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ENG 282: Engineering mathematics II

$\bar{F} = x^2 i + (3x+2)j + \sin x k$

a) $\frac{dF}{dx} = 2xi + 3j + \cos x k$

b) $\frac{d^2\bar{F}}{dx^2} = 2i - \sin x k$

c) $\left|\frac{dF}{dx}\right|$ at $x = 1 = 2(1)i + 3j + \cos(1)k$

$= 2i + 3j + 0.99k$

$= \sqrt{2^2 + 3^2 + (2.99)^2}$

$= \sqrt{14 + 9 + 0.778001}$

$= 3.74$

d) $\frac{d}{dx}(\bar{F}\cdot\bar{F})$

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

$= x^4 + 9x^2 + 12x + 4 + \sin^2 x$

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

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

$du/dx = \cos x, \; dv/dx = \cos x$

Using product rule.

$u\,dv/dx + v\,du/dx$

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

$= \sin x \cos x + \sin x \cos x$

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

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

$\frac{dx}{dx} = 1 = 4(1) + 18(1) + 12 + 2\sin(1)\cos(1)$