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17/ENG07/013
PETROLEUM ENGINEERING

ENG 282 Assignment 2

(1) Given that

$$F = xi + (3x+2)j + \sin x\,k$$

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

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

c. $\frac{dF}{dx}$ at $x = 1$

$$\frac{dF}{dx} = 2i + 3j + 0.9998k$$

$$\left|\frac{dF}{dx}\right| = \sqrt{(2)^2 + (3)^2 + (0.9998)^2}$$

$$= 3.74 \text{ units}$$

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

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

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

Note: $i \cdot i = 1$

$j \cdot j = 1$

$k \cdot k = 1$

$$\therefore \frac{d(F \cdot F)}{dx} = 4x^3 + 18x + 12 + 2\sin x \cos x$$

at $x = 1$

$$\frac{d}{dx}(F \cdot F) = 4(1)^3 + 18(1) + 12 + 2\sin(1)\cos(1)$$

$$= 4 + 18 + 12 + 0.085$$

$$= 34.035$$

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

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

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

$\frac{d^2r}{dt^2} = 2i + 12k$

$\left|\frac{d^2r}{dt^2}\right| = \sqrt{(2)^2+(0)^2+(2)^2}$

$= 2\sqrt{37}$ or 12.17 units