

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

$$c) \left| \frac{d^2r}{dt^2} \right| \text{ at } t=0 = 2i + [18 \sin(3) \cos] j + 12e^{2 \cos} k$$

$$= 2i + 18 \sin 0 j + 12e^0 k$$

$$\left(\frac{d^2r}{dt^2} \right) = \sqrt{2^2 + 12^2}$$

$$= \sqrt{148} = 12.17$$

1) Given that $F = x^2 + (3x+2)j + \sin x k$, find a) df/dx
 (b) d^2F/dx^2 (c) $|dF/dx|$ (d) $d/dx(F \cdot F)$ at $x=1$.

Soln

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

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

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

$$= \sqrt{4x^2 + 9 + \cos^2 x}$$

$$\text{at } x=1 \sqrt{4(1)^2 + 9 + \cos^2(1)} = \sqrt{13.99} = 3.74$$

$$(d) \frac{d(F \cdot F)}{dx} = (F \cdot F)' = [x^2i + (3x+2)j + \sin x k] \cdot [2xi + (3x+2)j + \sin x k]$$

$$= x^4 + (9x^2 + 6x + 6x + 4) + \sin^2 x$$

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

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

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

$$\text{at } x=1$$

$$= 4 + 18 + 12 + 0.635$$

$$= 34.635$$

2) If $r = (t^2 + 3t)i - 2\sin 3tj + 3e^{2t}k$ find (a) dr/dt (b) dr/dt (c) dr/dt

$$(c) \left| \frac{dr}{dt} \right| \text{ at } t=0$$

a. Soln

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