

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

$$\frac{dF}{dx} \text{ at } x=1$$

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

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

$$= 3.74 \text{ units}$$

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

~~derivative~~

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

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

c ~~$\frac{d^2r}{dt^2}$~~ $\frac{d^2r}{dt^2}$ at $t=0$

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

$$\left| \frac{d^2r}{dt^2} \right| = \sqrt{(2)^2 + (0)^2 + (12)^2}$$

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