

Maths ass2

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ENG282.

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ASS 2

1) Given that $f = x^2i + (3x+2)j + \sin xk$; find a) $\frac{df}{dx}$ b) $\frac{d^2f}{dx^2}$ c) $\left| \frac{df}{dx} \right|$
d) $\frac{d}{dx}(f \cdot f)$ at $x=1$

a) $\frac{df}{dx} = 2xi + 3j + \cos xk$

b) $\frac{d^2f}{dx^2} = 2i - \sin xk$

c) $\left| \frac{df}{dx} \right| = \sqrt{2x^2 + 3^2 + (\cos x)^2}$
 $= \sqrt{4x^2 + 9 + \cos^2 x}$
 at $x=1$ $\sqrt{4(1)^2 + 9 + \cos^2(1)} = \sqrt{13.99} = 3.74$

d) $\frac{d}{dx}(f \cdot f) = (f \cdot f) = [x^2i + (3x+2)j + \sin xk] \cdot [x^2i + (3x+2)j + \sin xk]$
 $= x^4 + (9x^2 + 6x + 4) + \sin^2 x$
 $= x^4 + 9x^2 + 6x + 4 + \sin^2 x$
 $\frac{d}{dx}(f \cdot f) = 4x^3 + 18x + 6 + 2 \sin x \cos x$
 $\frac{d}{dx}(f \cdot f)$ at $x=1 = 4(1)^3 + 18(1) + 6 + 2 \sin(1) \cos(1)$
 $= 4 + 18 + 6 + 0.035$
 $= 34.035$

2) If $r = (t^2 + 3t)i - 2 \sin 3tj + 3e^{2t}k$ find a) $\frac{dr}{dt}$ b) $\frac{d^2r}{dt^2}$ c) $\left| \frac{dr}{dt} \right|$ at $t=0$

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

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

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

$\left| \frac{dr}{dt} \right| = \sqrt{2^2 + 12^2} = \sqrt{148} = 12.17$