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 Civil Engineering

4002

1) $F = h^2 i + (3kx^2) j + 0.1xk$; $F = F_x i + F_y j + F_z k$
 a) $\frac{dF}{dh}$ b) $\frac{d^2F}{dh^2}$ c) $\left| \frac{dF}{dh} \right|$ d) $(F, F) = k = 1$

2011

a) $\frac{dF}{dh} = 2h i + 0 j + 0.1k$; at $h=1$

$= 2(1) i + 0 j + 0.1k$

$= 2i + 0j + 0.1k$

b) $\frac{d^2F}{dh^2} = 2i - 0.1k$; at $h=1$
 $= 2i - 0.1k$
 $= 2i - 0.1k$

c) $\left| \frac{dF}{dh} \right| = \sqrt{2^2 + 0^2 + (0.1)^2}$
 $= \sqrt{4.01}$
 $= 2.0025$

d) $\frac{d}{dh} (F, F) ; F, F = (h^2 + (3kx^2)j + 0.1xk) \cdot (h^2 + (3kx^2)j + 0.1xk)$
 $= h^4 + 7h^2 + 12k + 4 + 0.1k$

$\frac{d(F, F)}{dh} = 4h^3 + (12k + 13) + 0.1k$

at $h=1$; $= 4 + 12 + 13 + 0.1k$

$= 4 + 20 + 0.1k$

$= 24.1k$

$$\textcircled{2} \text{ If } r = (1^2 + 3t)j - 2\cos 3tj + 3e^{2t}k$$

Find

$$\textcircled{1} \frac{dr}{dt} \quad \textcircled{2} \frac{dr}{dt} \quad \textcircled{3} \text{ The value of } \frac{dr}{dt} \text{ at } t = 0$$

2012

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

$$\begin{aligned} \text{At } t=0; & (2(0) + 3)j - 6\cos(3(0))j + 6e^{2(0)}k \\ & = 3i - 6j + 6k \end{aligned}$$

$$\textcircled{3} \frac{dr}{dt} = 2i + 18\cos 3tj + 12e^{2t}k$$

$$\begin{aligned} \text{At } t=0; & 2i + 18\cos 3(0)j + 12e^{2(0)}k \\ & = 2i + 18k \end{aligned}$$

$$\textcircled{4} \left| \frac{dr}{dt} \right| = \sqrt{2^2 + 12^2}$$

$$= \sqrt{4 + 144}$$

$$= \sqrt{148}$$

$$= 2\sqrt{37}$$