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Recitation due Oct 5, 2021 20:30 IST

Parametric

1/1 point (graded)

Consider a particle with position at time t given by $ec{r}\left(t
ight)=\langle t^2,\sqrt{t^2+1}
angle$.

When the particle is at position $(oldsymbol{x},oldsymbol{y})$ a certain quantity $oldsymbol{w}$ has partial derivatives

$$\frac{\partial w}{\partial x} = e^{-x^2}, \quad \text{and} \quad \frac{\partial w}{\partial y} = y$$
 (6.229)

Compute $\dfrac{dw}{dt}$.

? INPUT HELP

Solution:

By the chain rule, we have

$$\frac{dw}{dt} = \frac{\partial w}{\partial x}\frac{dx}{dt} + \frac{\partial w}{\partial y}\frac{dy}{dt}$$
 (6.230)

We get
$$\dfrac{dx}{dt}$$
 and $\dfrac{dy}{dt}$ from $ec{r}\left(t
ight)=inom{t^2}{\sqrt{t+1}}.$

$$\frac{dx}{dt} = 2t, \qquad \frac{dy}{dt} = \frac{t}{\sqrt{t^2 + 1}}.$$
 (6.231)

We get $\frac{\partial w}{\partial x}$ and $\frac{\partial w}{\partial y}$ by re-writing the given values in terms of t:

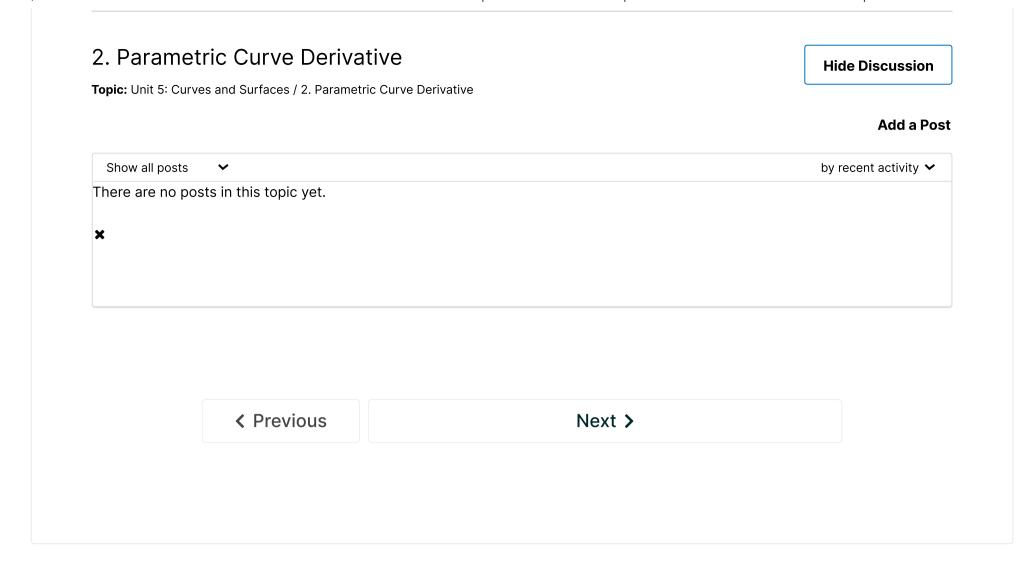
$$\frac{\partial w}{\partial x} = e^{-t^4}, \qquad \frac{\partial w}{\partial y} = \sqrt{t^2 + 1}$$
 (6.232)

Now, substituting everything in to the formula for $\dfrac{dw}{dt}$, we can conclude

$$\frac{dw}{dt} = e^{-t^4} (2t) + t. ag{6.233}$$

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You have used 1 of 5 attempts



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