Suppose you have an elastic rectangle. Its height is constant at 6 cm, but its width is a variable, $x$. At first $x = 10$ cm, but then it stretches to 10.8 cm, as shown below.

Find the change in width.

$\Delta x =$

Find the change in area.

$\Delta(6x) =$

True or false: $\Delta(6x) = 6\Delta x$

- False
- True
Suppose you have an elastic rectangle. Its width is constant at 10 cm, but its height is a variable, \( y \).
At first \( y = 6 \text{ cm} \), but then it stretches to 6.5 cm, as shown below.

Find the change in height.
\[ \Delta y = \text{ cm} \]

Find the change in area.
\[ \Delta (10y) = \text{ cm}^2 \]

True or false: \( \Delta (10y) = 10 \Delta y \)
- False
- True
Suppose you have an elastic rectangle. Width, \( x \), and height, \( y \), are both variable. At first the rectangle is 6 cm by 10 cm, but then both sides stretch to 6.5 cm by 10.8 cm.

Find the change in area. Round to the nearest whole number.

\[ \Delta(xy) = \] ___________

Compute

\[ \Delta x \cdot \Delta y = \] ___________

True or false: \( \Delta(xy) = \Delta x \cdot \Delta y \)

- False
- True

Compute and round to the nearest whole number:

\[ \Delta x \cdot (6 \text{ cm}) + (10 \text{ cm}) \cdot \Delta y = \] ___________

True or false: Rounded to the nearest whole number, \( \Delta(xy) = \Delta x \cdot (6 \text{ cm}) + (10 \text{ cm}) \cdot \Delta y \)

- False
- True
Suppose you have two functions:
\[ f(x) = x^2, \text{ and} \]
\[ g(x) = \sin x \]

Also, there is a third function formed by multiplying both of these:
\[ h(x) = x^2 \sin x \]

Answer the following questions. All answers must be accurate to at least two decimal places. Be careful with roundoff error.

Compute the rate of change of \( f \) on \([1,1.001]\).
\[ \frac{\Delta f}{\Delta x} = \quad \text{[answer]} \]

Compute the rate of change of \( g \) on \([1,1.001]\).
\[ \frac{\Delta g}{\Delta x} = \quad \text{[answer]} \]

Compute the rate of change of \( h \) on \([1,1.001]\).
\[ \frac{\Delta h}{\Delta x} = \quad \text{[answer]} \]

Compute
\[ \frac{\Delta f}{\Delta x} \cdot \frac{\Delta g}{\Delta x} = \quad \text{[answer]} \]

True or false: \[ \frac{\Delta h}{\Delta x} = \frac{\Delta f}{\Delta x} \cdot \frac{\Delta g}{\Delta x} \]
- False
- True

Compute
\[ \frac{\Delta f}{\Delta x} \cdot g(1) + f(1) \cdot \frac{\Delta g}{\Delta x} = \quad \text{[answer]} \]

True or false, rounded to two decimal places: \[ \frac{\Delta h}{\Delta x} = \frac{\Delta f}{\Delta x} \cdot g(1) + f(1) \cdot \frac{\Delta g}{\Delta x} \]
- False
- True
Suppose you have two functions:

- \( F(t) \) measures force applied to a lever. The units are Newtons. (WebAssign abbreviation \( N \).)
- \( L(t) \) measures the distance from the fulcrum to the force application point. The units are meters.
- \( t \) is measured in seconds.

Also, there is a third function formed by multiplying both of these. It’s called \textbf{torque}.

\[
T = F \cdot L
\]

What are the correct units for \( T \) ?
- \( \text{N} \)
- \( \text{m} \)
- \( \text{N} \cdot \text{m} \)
- \( \text{N} / \text{m} \)
- \( \text{N} / \text{sec} \)
- \( \text{m} / \text{sec} \)
- \( \text{N} \cdot \text{m} / \text{sec} \)
- \( \text{N} \cdot \text{m} / \text{sec}^2 \)

What are the correct units for \( \frac{dT}{dt} \)?
- \( \text{N} \)
- \( \text{m} \)
- \( \text{N} \cdot \text{m} \)
- \( \text{N} / \text{m} \)
- \( \text{N} / \text{sec} \)
- \( \text{m} / \text{sec} \)
- \( \text{N} \cdot \text{m} / \text{sec} \)
- \( \text{N} \cdot \text{m} / \text{sec}^2 \)

What are the correct units for \( \frac{dL}{dt} \)?
- \( \text{N} \)
- \( \text{m} \)
- \( \text{N} \cdot \text{m} \)
- \( \text{N} / \text{m} \)
- \( \text{N} / \text{sec} \)
- \( \text{m} / \text{sec} \)
- \( \text{N} \cdot \text{m} / \text{sec} \)
- \( \text{N} \cdot \text{m} / \text{sec}^2 \)

What are the correct units for \( \frac{d}{dt}(F \cdot L) \)?
- \( \text{N} \)
- \( \text{m} \)
- \( \text{N} \cdot \text{m} \)
- \( \text{N} / \text{m} \)
- \( \text{N} / \text{sec} \)
- \( \text{m} / \text{sec} \)
- \( \text{N} \cdot \text{m} / \text{sec} \)
- \( \text{N} \cdot \text{m} / \text{sec}^2 \)

What are the correct units for \( \frac{dF}{dt} \cdot \frac{dL}{dt} \)?
- \( \text{N} \)
- \( \text{m} \)
- \( \text{N} \cdot \text{m} \)
- \( \text{N} / \text{m} \)
- \( \text{N} / \text{sec} \)
- \( \text{m} / \text{sec} \)
- \( \text{N} \cdot \text{m} / \text{sec} \)
- \( \text{N} \cdot \text{m} / \text{sec}^2 \)

What are the correct units for \( \frac{dF \cdot L}{dt} + F \cdot \frac{dL}{dt} \)?
- \( \text{N} \)
- \( \text{m} \)
- \( \text{N} \cdot \text{m} \)
- \( \text{N} / \text{m} \)
- \( \text{N} / \text{sec} \)
- \( \text{m} / \text{sec} \)
- \( \text{N} \cdot \text{m} / \text{sec} \)
- \( \text{N} \cdot \text{m} / \text{sec}^2 \)

Based on units alone, which of the following could possibly be true? Select all that apply.

- \( \frac{d}{dt}(F \cdot L) = \frac{dF}{dt} \cdot \frac{dL}{dt} \)
- \( \frac{d}{dt}(T) = \frac{dF}{dt} \cdot L + F \cdot \frac{dL}{dt} \)
- \( \frac{d}{dt}(T) = \frac{dF}{dt} \cdot \frac{dL}{dt} \)
- \( \frac{d}{dt}(F \cdot L) = \frac{dF}{dt} \cdot L + F \cdot \frac{dL}{dt} \)

6. Question Details

Use the Product Rule to calculate the derivative.

\[
f(x) = x^3(7x^2 + 5)
\]

\[
f'(x) =
\]
7. Question Details  
Calculate the following derivative.  
\[ \frac{d}{dx}(x \cos(5 - 2x)) = \]

8. Question Details  
Use the Product Rule to calculate the derivative.  
\[ f(x) = (x + 3)^2e^{(x + 3)} \]
\[ f'(x) = \]

9. Question Details  
Find the derivative of \( f(x) = 3x^2 \sin x + 4x \cos x \).  
\[ f'(x) = \]

10. Question Details  
Compute the derivative of \( k(\theta) = \theta^2 \sin^2 \theta \).  
\[ k'(\theta) = \]

11. Question Details  
Calculate the following derivative. (Assume \( a \) and \( b \) are constants.)  
\[ \frac{d}{dx}((ax + b)(abx^4 + 7)) \]
\[ f'(x) = \]

12. Question Details  
The current in a circuit is given by  
\[ i(t) = te^{-2.6t} \]
where \( i \) is in amperes (A) and \( t \) is in seconds. How fast is current changing at the instant when \( t = 0.5 \) seconds? Be accurate to four decimal places and include correct units.

Assignment Details