1. Find the derivative.

$$y = (5x + 11)^3$$

$\frac{dy}{dx} = \square$

2. Find the derivative.

$$y = (4x^3 + 7)^{3/2}$$

$\frac{dy}{dx} = \square$

3. Find $\frac{dy}{dx}$ for $y = x(5x^2 + 3)^{1/2}$.

$\frac{dy}{dx} = \square$

4. Differentiate the given function.

$$y = \left(\frac{x-1}{x-7}\right)^3$$

$\frac{dy}{dx} = \square$

5. The displacement s (in cm) of a linkage joint of a robot is given by $s = (4t - t^2)^{2/3}$, where t is the time (in s). Find the velocity of the joint for $t = 2.75$ s.

The velocity is $\square$ cm/s.

(Round to two decimal places as needed.)

6. Find all the higher derivatives of the following function.

$$f(x) = 4x^3 - 5x^4$$

$f'(x) =$ ☐

$f''(x) =$ ☐

$f'''(x) =$ ☐

$f^{(4)}(x) =$ ☐

$f^{(5)}(x) =$ ☐

Will all higher derivatives evaluate to zero?

- ○ Yes
- ○ No

7. Find $f''(x)$.

$$f(x) = (x^2 + 9)^7$$

$f''(x) =$ ☐

8. Find the second derivative of the given function.

$$f(R) = \frac{5 - 6R}{5 + 6R}$$

$f''(R) =$ ☐

9. Evaluate the second derivative of $f(x)=\sqrt{x^2+27}$ for $x=3$.

Select the correct choice below and fill in any answer boxes in your choice.

- A. $f''(3)=$ ☐ (Type an integer or a simplified fraction.)
- B. The solution is undefined.

10. If the population of a city is $P=9000(1+0.08t+0.008t^2)$, where t is in years from 2000, what is the acceleration in the size of the population?

$\frac{d^2P}{dt^2}=$ ☐

11. A bullet is fired vertically upward in a controlled test environment. Its distance s (in ft) above the ground is given by $s=2950t-21.9t^2$, where t is the time (in s). Find the acceleration of the bullet.

☐ feet per second squared
(Type an integer or a decimal.)

12. The voltage V induced in an inductor in an electric circuit is given by the equation below where L is the inductance (in H). Find the expression for the voltage induced in a 1.66-H inductor if $q=\sqrt{2t+5}-5$.

$$V=L\frac{d^2q}{dt^2}$$

$V=$ ☐

1. Differentiate.

$$y = 3x^3 - 13x^2 + 16x + 4$$

$\frac{dy}{dx} = \square$

2. Find the derivative of the given function.

$$y = \frac{1}{14}x^{14} + \frac{1}{9}x^9$$

$\frac{dy}{dx} = \square$

3. Evaluate the derivative of the following function at the given point. Check your result using the derivative evaluation of a graphing calculator.

$$y = 6x^3 + 3x - 2; \ (-1, -11)$$

The derivative of y at $(-1, -11)$ is $\square$.
(Type an integer or a decimal.)

4. Let s represents the displacement, and let t represents the time for an object moving with rectilinear motion, according to the given function. Find the instantaneous velocity for the given time.

$$s = 50 + 420t - 60t^2; \ t = 3.5$$

The instantaneous velocity is $\square$. (Simplify your answer.)

5. The electric power P (in W) as a function of the current i (in A) in a certain circuit is given by $P = 16i^2 + 60i$. Find the instantaneous rate of change of P with respect to i for i = 1.25 A.

The instantaneous rate of change of P is $\square$ W/A for i = 1.25.
(Simplify your answer.)

6. Find the derivative of the function. Do not find the product before finding the derivative.

$$y = (7x^2 - x + 2)(4 - x^5)$$

Choose the correct answer below.

- A. $y' = (7x^2 - x + 2)(5x^4) + (4 - x^5)(14x - 1)$
- B. $y' = (-5x^4)(14x - 1) + (7x^2 - x + 2)(4 - x^5)$
- C. $y' = (7x^2 - x + 2)(-5x^4) + (4 - x^5)(14x - 1)$
- D. $y' = (4 - x^5)(-5x^4) + (14x - 1)(7x^2 - x + 2)$

7. Evaluate the derivative of the given function for the given value of x.

$$y = \frac{3x - 6}{4x + 9}, \quad x = 1$$

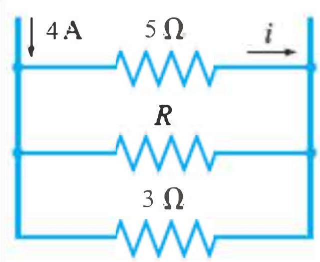
$$\left.\frac{dy}{dx}\right|_{x=1} = \square$$

(Type an integer or a simplified fraction.)

8. If a constant current of 4 A passes through the current divider parallel resistors shown in the figure to the right, the current i is given by

$$i = \frac{12R}{8R + 15},$$ where R is a variable resistor.

Find $\frac{di}{dR}$.



$$\frac{di}{dR} = \square$$

9. A computer, using data from a refrigeration plant, estimated that in the event of a power failure the temperature C (in °C) in the freezers would be given by $C = \frac{3t}{0.05t + 3} - 35$, where t is the number of hours after the power failure. Find the time rate of change of temperature after 4.0 h.

The time rate of change after 4.0 h is $\square$ °C / h.

(Round to one decimal place as needed.)

10. A certain physical property is given by the formula below. Find the derivative of P with respect to r, assuming that the other quantities remain constant.

$$P = \frac{B^3 r}{9R^2 + 6Rr + r^2}$$

$\frac{dP}{dr} = \square$

11. Using the definition, calculate the derivative of the function. Then find the values of the derivative as specified.

$g(t) = \frac{6}{t^4};\quad g'(-3), g'(3), g'(\sqrt{3})$

$g'(t) = \square$

$g'(-3) = \square$

$g'(3) = \square$

$g'(\sqrt{3}) = \square$

12. Find the error in the following work.

$$D_x\left(\frac{2x+5}{x^2-1}\right) = \frac{(2x+5)(2x)-(x^2-1)2}{(x^2-1)^2}$$
$$= \frac{4x^2+10x-2x^2+2}{(x^2-1)^2}$$
$$= \frac{2x^2+10x+2}{(x^2-1)^2}$$

Choose the correct answer below.

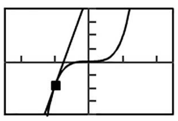
- A. In all three steps, the denominator should be $(2x+5)^2$.
- B. In the last step, the numerator should be $2x^2-10x+2$.
- C. In the first step, the numerator should be $(x^2-1)(2x+5)-(2x)2$.
- D. In the first step, the numerator should be $(x^2-1)2-(2x+5)(2x)$.

1. Find the slope of a line tangent to the curve $y = 4x^5 + 5x^3$ at $x = 1$. Use the tangent feature of a graphing calculator to display the curve and the tangent line.

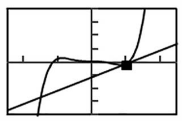
$\left.\frac{dy}{dx}\right|_{x=1} = \square$

Use the tangent feature of a graphing calculator to display the curve and the tangent line at $x = 1$. Select the correct plot below. All graph windows are $[-2.5,2.5]$ by $[-20,20]$.

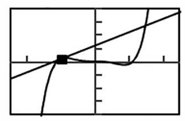
○A.



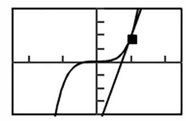
○B.



○C.



○D.



2. The resistance R (in Ω) of a certain wire as a function of the temperature T (in °C) is given by $R = 15.0 + 0.550T + 0.0625T^2$. Find the instantaneous rate of change of R with respect to T when T = 108°C.

The instantaneous rate of change of R with respect to T when T = 108°C is $\square$ Ω / °C.
(Type an integer or a decimal rounded to the nearest tenth as needed.)

3. Find the derivative of the function. Do not find the product before finding the derivative.

$$y = (3x^4 - x + 2)(5 - x^5)$$

Choose the correct answer below.

○A. $y' = (-5x^4)(12x^3 - 1) + (3x^4 - x + 2)(5 - x^5)$

○B. $y' = (3x^4 - x + 2)(-5x^4) + (5 - x^5)(12x^3 - 1)$

○C. $y' = (5 - x^5)(-5x^4) + (12x^3 - 1)(3x^4 - x + 2)$

○D. $y' = (3x^4 - x + 2)(5x^4) + (5 - x^5)(12x^3 - 1)$

4. Evaluate the derivative of the given function for the given value of n. Check your results using the derivative evaluation feature of a graphing calculator.

$$S = \frac{n^3 - 8n + 7}{3n - n^4}, \quad n = -1$$

$S'(-1) = \square$

(Type an integer or decimal rounded to the nearest thousandth as needed.)

5. A certain physical property is given by the formula below. Find the derivative of P with respect to r, assuming that the other quantities remain constant.

$$P = \frac{D^4 r}{R^2 + 2Rr + r^2}$$

$\frac{dP}{dr} = \square$

6. Differentiate the given function.

$$u = v^2\sqrt{2v - 7}$$

$\frac{du}{dv} = \square$

7. Differentiate the given function.

$$y = \left(\frac{x + 6}{x - 5}\right)^6$$

$\frac{dy}{dx} = \square$

8. Evaluate the second derivative of the given function for the given value of x.

$y = 3x^{\frac{2}{3}} - \frac{4}{x}, x = -1$

Evaluate the second derivative at $x = -1$.

$y''(-1) =$ ☐ (Type an integer or a simplified fraction.)

9. The deflection y (in m) of a 5.00-m beam as a function of the distance (in m) from one end is $y = 0.0008(9x^5 - 75x^2)$. Find the value of $\frac{d^2y}{dx^2}$ (the rate of change at which the slope of the beam changes), where $x = 4.00$.

$\frac{d^2y}{dx^2} =$ ☐ (Type an integer or a decimal.)

10. The total solar radiation H (in W/m^2) on a particular surface during an average clear day in one U.S. city is given by $H = \frac{7{,}000}{t^2 + 10}$, where t is the number of hours from noon. Find a general expression which can be used to determine how fast the rate of change of solar radiation on the surface is changing at any given time (ie find d^2H/dt^2).

A. $\frac{14{,}000(2t^2 - 5)}{(t^2 + 10)^3}$

B. $\frac{14{,}000(3t^2 - 10)}{(t^2 + 10)^3}$

C. $\frac{14{,}000(-t^2 + 2t - 10)}{(t^2 + 10)^3}$

D. $\frac{14{,}000(t^2 - 10)}{(t^2 + 10)^4}$