

Principles of Calculus Modeling: An Interactive Approach by Donald Kreider, Dwight Lahr, and Susan Diesel
Exercises for Section 2.8

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1. (1 pt)

If $f(x) = x^{17} - x^{15}$, what is $f'(x)$?

$f'(x) =$ _____

2. (1 pt)

If $f(x) = \frac{8}{x^3} + \frac{5}{x^2} - 1$, find $f'(x)$.

$f'(x) =$ _____

3. (1 pt)

Find the derivative of the following function.

$G(x) = (-5 - x)(-2 - 2x)$

$G'(x) =$ _____

4. (1 pt)

Let $f(t) = \frac{-6 + \sqrt{t}}{-1 - \sqrt{t}}$. What is the derivative of f ?

$f'(t) =$ _____

5. (1 pt)

If $f(x) = (x^{-14} + x^{-13} + 5)(x^{14} + x^{13} + 2)$, what is $f'(x)$?

$f'(x) =$ _____

6. (1 pt)

Calculate $\left. \frac{d}{dx} \left(\frac{x^2 - 10}{x^2 + 10} \right) \right|_{x=3}$.

7. (1 pt)

Find the equation of the tangent line to the function $f(x) = x + \frac{33}{1 + \sqrt{x}} + 7$ at the point $(4, 22)$. Write the equation of the tangent line in slope-intercept form.

$y =$ _____

8. (1 pt)

Find the derivative of the following function.

$y = \left(1 + \frac{x}{10}\right)^{76}$

$y' =$ _____

9. (1 pt)

Find the derivative of $f(t) = (10 - 7t^2)^{-5/2}$.

$f'(t) =$ _____

10. (1 pt)

If $f(x) = \left(9 + \sqrt{\frac{x+2}{10}}\right)^2$, find $f'(x)$.

$f'(x) =$ _____

11. (1 pt)

Let $y = -2x^2 + \frac{6}{x} + 1$. Find each of the following.

$y' =$ _____

$y'' =$ _____

$y''' =$ _____

12. (1 pt)

Let $y = \frac{x+10}{x-10}$. Find each of the following.

$y' =$ _____

$y'' =$ _____

$y''' =$ _____

13. (1 pt)

Let $f(x) = (3 + 15x)^n$. What is $f'(x)$?

14. (1 pt)

Suppose you have a convex lens with focal length 17 cm. If an object is placed p cm away from the lens, its image will appear to be q cm from the lens, where p , q , and 17 are related by the following equation:

$$\frac{1}{17} = \frac{1}{p} + \frac{1}{q}$$

This is known as the **lens equation**.

What is the rate of change of p with respect to q ?

$\frac{dp}{dq} =$ _____

15. (1 pt)

Let $f(x)$ be a differentiable curve that has positive values everywhere, but never has a horizontal tangent. Find the value of y such that the rate of change of y^4 with respect to x is 72 times the rate of change of y with respect to x .

$y =$ _____

16. (1 pt)

When Emperors of the Ming Dynasty began to rebuild the Great Wall of China in the 14th Century CE, they found that the increasing wealth of their nation gave them ever more resources to apply to the wall. Assume that the amount of money they had for wall-building was represented by the function $d(t) = 12t^{\frac{4}{3}} + 12t$ million dollars, where t is the number of years that the wall had been worked on. Due to the difficulties of rapid production, the number of feet of wall completed each year is represented by the function $g(d) = \sqrt{d}$ feet, where d is the number of dollars available.

What is the rate of change of the number of feet of wall completed with respect to t when $t = 40$?

$\frac{dg}{dt} =$ _____

