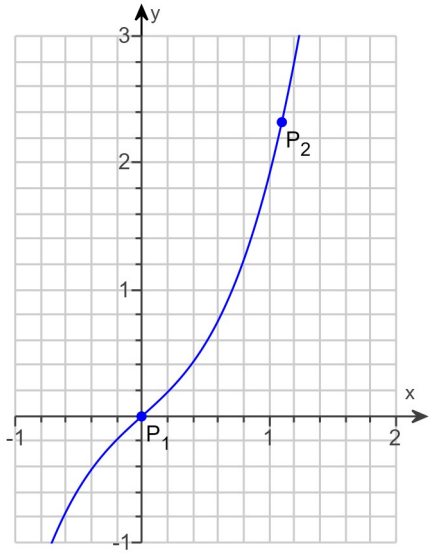
Student: Cole Lamers **Date:** 09/05/19	**Instructor:** Viktoriya Shcherban **Course:** Calc 1 11:30 AM / Internet (81749&81750) Shcherban	**Assignment:** 3.1 Tangents and the Derivatives at a Point

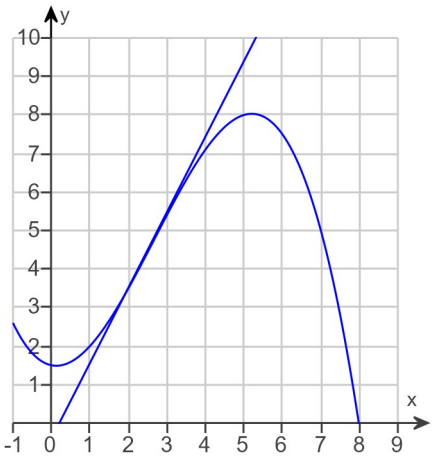
1. Use the grid to make a rough estimate of the slope of the curve (in y-units per x-unit) at the points P_1 and P_2.



The slope at P_1 is approximately 1.

The slope at P_2 is approximately 5.

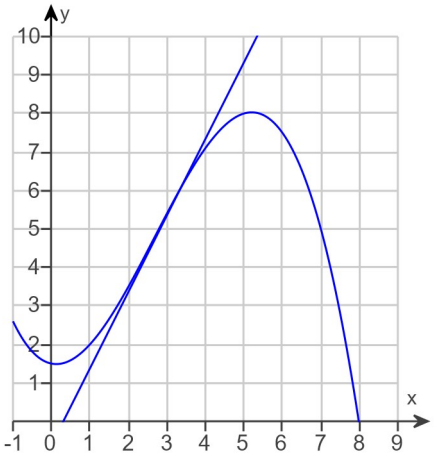
2. Estimate the slope (in y-units per x-unit) of the tangent line to the curve.



What is your estimate of the slope?

slope ≈ 2 (Round to the nearest integer.)

3. Estimate the slope (in y-units per x-unit) of the tangent line to the curve.



What is your estimate of the slope?

slope ≈ 2 (Round to the nearest integer.)

4. Find an equation for the line tangent to $y = -1 - 3x^2$ at $(5, -76)$.

The equation for the line tangent to $y = -1 - 3x^2$ at $(5, -76)$ is $y =$ $-30x + 74$.

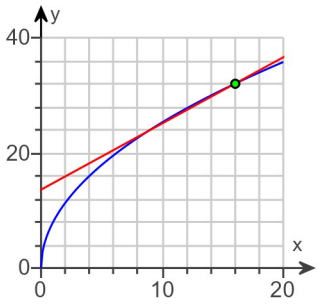
5. Find an equation for the tangent to the curve at the given point. Then sketch the curve and the tangent together.

$y = 8\sqrt{x}$, (16,32)

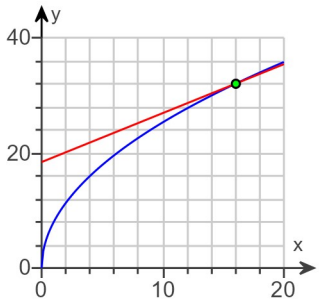
$y =$ $x + 16$

Choose the correct graph of the curve and the tangent below.

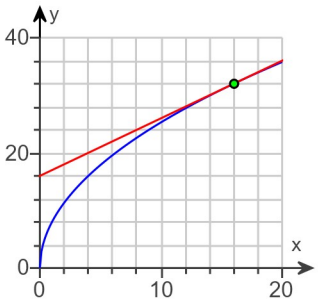
A.



B.



C.

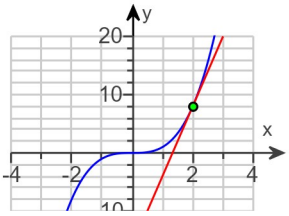


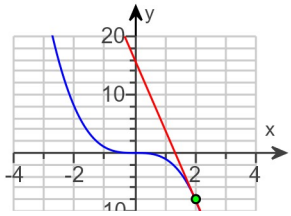
6. Find an equation for the tangent to the curve at the given point. Then sketch the curve and the tangent together.

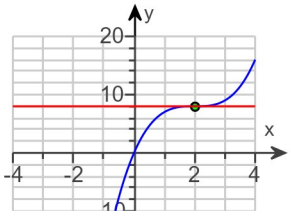
$y = x^3$, (2,8)

y = 12x − 16

Choose the correct graph of the curve and the tangent below.

A. 

B. 

C. 

7. Find the slope of the function's graph at the given point. Then find an equation for the line tangent to the graph there.

$f(x) = x^2 + 3$, (3,12)

What is the slope of the function's graph at the given point?

m = 6 (Simplify your answer.)

Find an equation for the line tangent to the graph at the given point.

y = 6x − 6

8. Find the slope of the graph of the function $y = \frac{7x}{x-3}$ at (6,14). Then find an equation for the line tangent to the graph at that point.

The slope of the graph of the function $y = \frac{7x}{x-3}$ at (6,14) is $-\frac{7}{3}$.

(Type a simplified fraction.)

The equation for the line tangent to $y = \frac{7x}{x-3}$ at (6,14) is $y = -\frac{7}{3}x + 28$.

9. Find the slope of the function's graph at the given point. Then find an equation for the line tangent to the graph there.

$h(t) = -t^3$, (1, − 1)

What is the slope of the function's graph at the given point?

m = − 3 (Simplify your answer.)

Find an equation for the line tangent to the graph at the given point.

y = − 3t + 2

10. Find the slope of the graph of the function $y = \sqrt{2x}$ at (2,2). Then find an equation of the line tangent to the graph at that point.

The slope of the graph of the function $y = \sqrt{2x}$ at (2,2) is $\frac{1}{2}$.

(Type a simplified fraction.)

The equation of the tangent to $y = \sqrt{2x}$ at (2,2) is $y = \frac{1}{2}x + 1$.

11. Find the slope of the curve $y = -9x^2$ at $(1, -9)$.

The slope of the curve $y = -9x^2$ at $(1, -9)$ is -18. (Simplify your answer.)

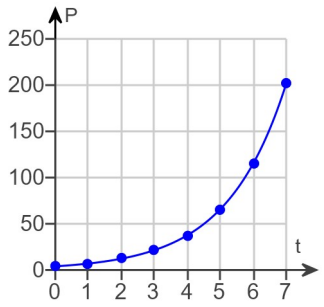
12. Find the slope of the following curve at $x = 9$.

$$y = \frac{1}{x - 4}$$

The slope of the given curve at $x = 9$ is $-\frac{1}{25}$.

(Simplify your answer.)

13. In a controlled laboratory experiment, yeast cells are grown in an automated cell culture system that counts the number P of cells present at hourly intervals. The number after t hours is shown in the accompanying figure. Complete parts (a) through (c) below.



a. Explain what is meant by the derivative $P'(6)$. What are its units?

Choose the correct answer below.

- **A.** The derivative $P'(6)$ represents the average rate of change of the number of cells from $t = 0$ to $t = 6$.
- **B.** The derivative $P'(6)$ represents the number of cells at $t = 6$.
- **C.** The derivative $P'(6)$ represents the rate of change of the number of cells at $t = 6$.
- **D.** The derivative $P'(6)$ represents the average number of cells from $t = 0$ to $t = 6$.

The units of the derivative $P'(6)$ are the number of cells per hour.

b. Which is larger, $P'(2)$ or $P'(3)$? Give a reason for your answer.

- **A.** $P'(3)$ is larger, because the slope of the graph of P(t) is greater at $t = 3$ than at $t = 2$.
- **B.** $P'(2)$ is larger, because the slope of the graph of P(t) is greater at $t = 2$ than at $t = 3$.
- **C.** $P'(2)$ is larger, because the value of P(t) is greater at $t = 2$ than at $t = 3$.
- **D.** $P'(3)$ is larger, because the value of P(t) is greater at $t = 3$ than at $t = 2$.

c. The quadratic curve capturing the trend of the data points is given by $P(t) = 6.16t^2 - 18.07t + 13.54$. Find the instantaneous rate of growth when $t = 6$ hours.

The instantaneous rate of growth is 55.85 $\frac{\text{cells}}{\text{hour}}$.

(Round to two decimal places as needed.)

14. Find the point (x,y), at which the graph of $y = 6x^2 + 7x - 3$ has a horizontal tangent.

The function $y = 6x^2 + 7x - 3$ has a horizontal tangent at $\left(-\frac{7}{12}, -\frac{121}{24}\right)$.

(Type an ordered pair. Type simplified fractions.)

15. An object is dropped from the top of a cliff 660 meters high. Its height above the ground t seconds after it is dropped is $660 - 4.9t^2$. Determine its speed 3 seconds after it is dropped.

The speed of the object 3 seconds after it is dropped is 29.4 m/sec.

(Simplify your answer.)

16. What is the rate of change of the area of a square $\left(A = s^2\right)$ with respect to the side length when the side length is $s = 3$?

The area changes at a rate of 6 .

(Type an exact answer, using π as needed.)

17. What is the rate of change of the volume of a ball $\left(V = \frac{4}{3}\pi r^3\right)$ with respect to the radius when the radius is $r = 4$?

The volume changes at a rate of 64π .
(Type an exact answer, using π as needed.)