Student: Cole Lamers **Date:** 09/05/19	**Instructor:** Viktoriya Shcherban **Course:** Calc 1 11:30 AM / Internet (81749&81750) Shcherban	**Assignment:** 3.2 The Derivative as a Function

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

$f(x) = 6 - x^2$; $f'(-1)$, $f'(0)$, $f'(6)$

$f'(x) = -2x$

$f'(-1) = 2$

$f'(0) = 0$

$f'(6) = -12$

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

$g(t) = \frac{8}{t^3}$; $g'(-3)$, $g'(1)$, $g'(\sqrt{5})$

$g'(t) = -\frac{24}{t^4}$

$g'(-3) = -\frac{8}{27}$

$g'(1) = -24$

$g'(\sqrt{5}) = -\frac{24}{25}$

3. Use the definition to calculate the derivative of the following function. Then find the values of the derivative as specified.

$p(\theta) = \sqrt{3\theta}$; $p'(1)$, $p'(3)$, $p'\left(\frac{2}{3}\right)$

$p'(\theta) = \frac{\sqrt{3}}{2\sqrt{\theta}}$

$p'(1) = \frac{\sqrt{3}}{2}$

$p'(3) = \frac{\sqrt{3}}{2\sqrt{3}}$

$p'\left(\frac{2}{3}\right) = \frac{\sqrt{3}}{2\sqrt{\frac{2}{3}}}$

4. Find the indicated derivative.

$\frac{dy}{dx}$ if $y = 8x^3$

$\frac{dy}{dx} =$ $24x^2$

5. Find $\frac{ds}{dt}$ if $s = \frac{t}{5t+4}$.

$\frac{ds}{dt} =$ $\frac{4}{(5t+4)^2}$

6. Differentiate the function, and find the slope of the tangent line at the given value of the independent variable.

$f(x) = 2x + \frac{5}{x}$, $x = 3$

The derivative of the function $f(x) = 2x + \frac{5}{x}$ is $2 - \frac{5}{x^2}$.

The slope of the tangent line at $x = 3$ is $\frac{13}{9}$.

7. Differentiate the function and find the slope of the tangent line at the given value of the independent variable.

$s = t^3 - 2t^2$, $t = 7$

$s'(t) =$ $3t^2 - 4t$

The slope of the tangent line is 119 at $t = 7$.

8. Find the value of the derivative.

$\left.\frac{dy}{dx}\right|_{x=-3}$ if $y = 7 - 4x^2$

If $y = 7 - 4x^2$, $\left.\frac{dy}{dx}\right|_{x=-3} =$ 24. (Simplify your answer.)

9. Use the formula $f'(x) = \lim_{z \to x} \frac{f(z) - f(x)}{z - x}$ to find the derivative of the following function.

$f(x) = \frac{5}{x+4}$

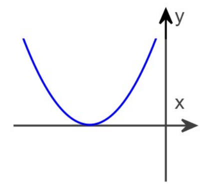
$f'(x) =$ $-\frac{5}{(x+4)^2}$

10. Use the formula $f'(x) = \lim_{z \to x} \dfrac{f(z) - f(x)}{z - x}$ to find the derivative of the following function.

$f(x) = 5x^2 - x + 4$

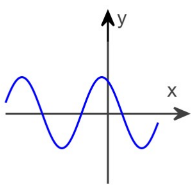
$f'(x) =$ $10x - 1$

11. Graph the derivative of the function graphed on the right.



Choose the correct graph below.

A.



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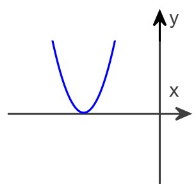

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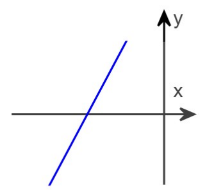
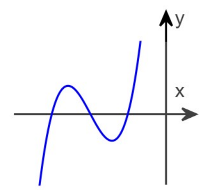
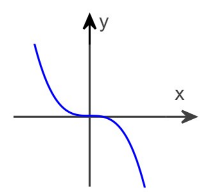


D.

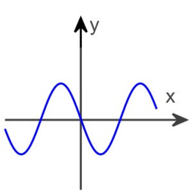


12. Graph the derivative of the function graphed on the right.

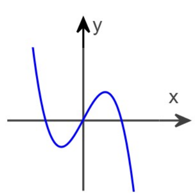


Choose the correct graph below.

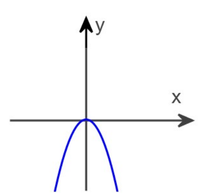
A.



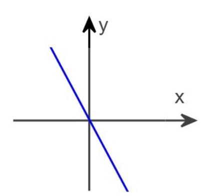
B.



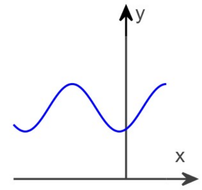
C.



D.



13. Graph the derivative of the function graphed on the right.



Choose the correct graph below.

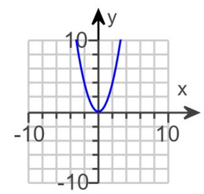
A.

B.

C.

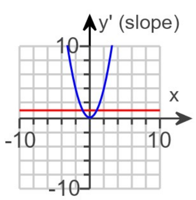
D.

14. Match the graph of the function on the right with the graph of its derivative.

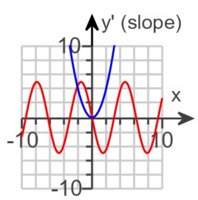


Choose the correct graph of the function (in blue) and its derivative (in red) below.

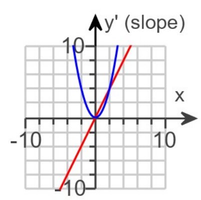
A.



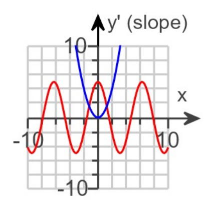
B.



C.

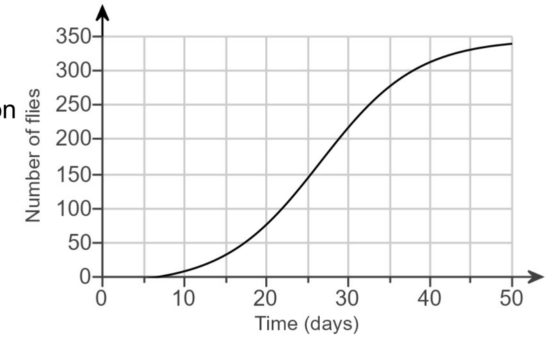


D.



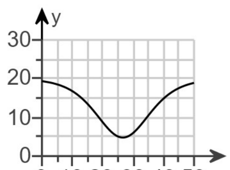
15. Populations starting out in closed environments grow slowly at first, when there are relatively few members, then more rapidly as the number of reproducing individuals increases and resources are still abundant, then slowly again as the population reaches the carrying capacity of the environment.

Answer parts **a** and **b** below.

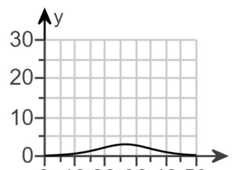


a. Use graphical techniques to graph the derivative of the fruit fly population, using the given graph of the population. Choose the correct graph of the derivative.

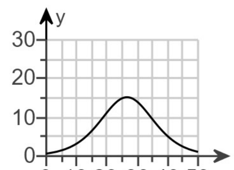
A.



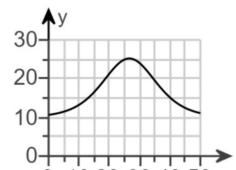
B.



C.



D.

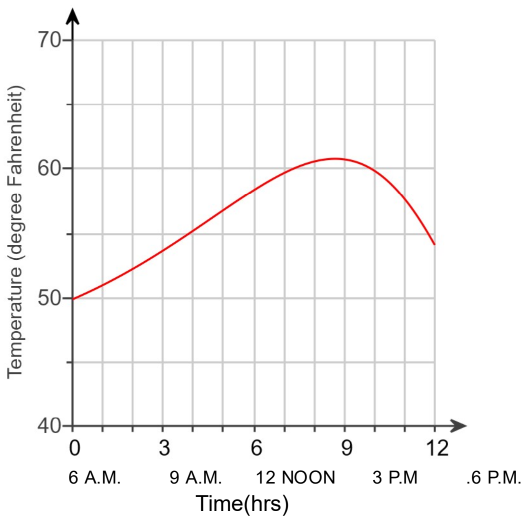


b. During what days does the population seem to be increasing fastest? Slowest? Fill in the blanks.

The population seems to increase fastest during days 20 through 30 and slowest during days 0 and 50.

16.

The given graph shows the temperature T in °F at a city between 6 A.M. and 6 P.M.



Answer parts **(a)** through **(c)**.

(a) Estimate the rate of temperature at the following times for i) through iv).

i) Which of the following is the rate of temperature change at 7 A.M?

- 1.2 °F/hr
- 11.2 °F/hr
- − 1.2 °F/hr
- − 11.2 °F/hr

ii) Which of the following is the rate of temperature change at 9 A.M?

- − 1.5 °F/hr
- − 11.5 °F/hr
- 11.5 °F/hr
- 1.5 °F/hr

iii) Which of the following is the rate of temperature change at 2 P.M?

- 10.6 °F/hr
- − 0.6 °F/hr
- 0.6 °F/hr
- − 10.6 °F/hr

iv) Which of the following is the rate of temperature change at 4 P.M?

- 11.5 °F/hr
- − 1.5 °F/hr
- 1.5 °F/hr
- − 11.5 °F/hr

(b) At what time does the temperature increase most rapidly? Decrease most rapidly? What is the rate for each of those times?

A. The temperature increases most rapidly at 6 P.M. and the rate is 1.6 °F/hr, and the temperature decreases most rapidly at 11 A. M. and the rate is − 4.2 °F/hr.

B. The temperature increases most rapidly at 11 A. M. and the rate is 16.6 °F/hr, and the temperature decreases most rapidly at 6 P.M.and the rate is − 19.2 °F/hr.

C. The temperature increases most rapidly at 11 A. M. and the rate is 1.6 °F/hr, and the temperature decreases most rapidly at 6 P.M.and the rate is − 4.2 °F/hr.

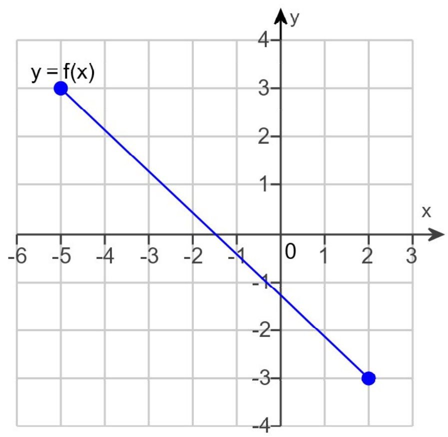
D. The temperature increases most rapidly at 6 P.M. and the rate is 16.6 °F/hr, and the temperature decreases most rapidly at 11 A. M. and the rate is − 19.2 °F/hr.

(c) Which of the following is the graph of the derivative of temperature T versus time t?

A. **B.**

17.

The figure below shows the graph of a function over the closed interval $-5 \le x \le 2$. Complete parts (a) through (c) to the right.



a. At what domain points does the function appear to be differentiable?

- **A.** $x = 2$
- **B.** $-5 \le x \le 2$ ✓
- **C.** $x = -5$
- **D.** None

b. At what domain points does the function appear to be continuous but not differentiable?

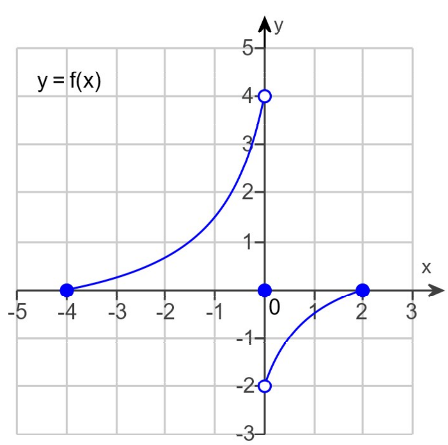
- **A.** $x = 2$
- **B.** $x = -5$
- **C.** $-5 \le x \le 2$
- **D.** None ✓

c. At what domain points does the function appear to be neither continuous nor differentiable?

- **A.** $x = 2$
- **B.** $x = -5$
- **C.** $-5 \le x \le 2$
- **D.** None ✓

18.

The figure below shows the graph of a function over the closed interval $-4 \le x \le 2$. Complete parts (a) through (c) to the right.



a. At what domain points does the function appear to be differentiable?

- **A.** $-4 \le x < 0,\ 0 < x \le 2$ ✓
- **B.** $-4 \le x \le 2$
- **C.** $x = 0$
- **D.** None

b. At what domain points does the function appear to be continuous but not differentiable?

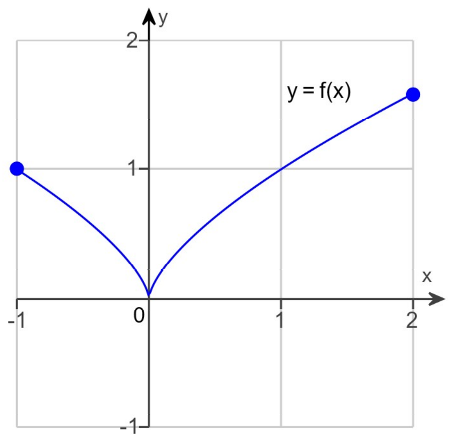
- **A.** $-4 \le x \le 2$
- **B.** $-4 \le x < 0,\ 0 < x \le 2$
- **C.** $x = 0$
- **D.** None ✓

c. At what domain points does the function appear to be neither continuous nor differentiable?

- **A.** $-4 \le x < 0,\ 0 < x \le 2$
- **B.** $x = 0$ ✓
- **C.** $-4 \le x \le 2$
- **D.** None

19.

The figure below shows the graph of a function over the closed interval $[-1, 2]$.



Answer parts **(a)** through **(c)**.

(a) At what domain points does the function appear to be differentiable?

- **A.** $x = -1$
- **B.** $-1 \leq x < 0$, $0 < x \leq 2$
- **C.** $x = 2$
- **D.** None

(b) At what domain points does the function appear to be continuous but not differentiable?

- **A.** $x = -1$
- **B.** $x = 0$
- **C.** $x = 2$
- **D.** None

(c) At what domain points does the function appear to be neither continuous nor differentiable?

- **A.** $x = 0$
- **B.** $x = -1$
- **C.** $x = 2$
- **D.** None