

Slopes & Velocity Homework

1. Suppose an object moves in one direction along a line so that its position $f(t)$ (in meters) at time t (in seconds) is given by $f(t) = 3t^2$.

- What is the average velocity of the object from $t = 0$ to $t = 3$?
- What is the average velocity of the object from $t = 0$ to $t = 5$?
- What is the average velocity of the object from $t = 2$ to $t = 5$?
- What is the instantaneous velocity of the object at $t = 2$?
- What is the instantaneous velocity of the object at $t = 5$?

2. Suppose an object moves in one direction along a line so that its position $f(t)$ (in meters) at time t (in seconds) is given by $f(t) = \sqrt{t} + 2$.

- What is the average velocity of the object from $t = 0$ to $t = 4$?
- What is the average velocity of the object from $t = 0$ to $t = 9$?
- What is the average velocity of the object from $t = 4$ to $t = 25$?
- What is the instantaneous velocity of the object at $t = 9$?
- What is the instantaneous velocity of the object at $t = 16$?

3. Suppose an object moves in one direction along a line so that its position $f(t)$ (in meters) at time t (in seconds) is given by $f(t) = \frac{2}{t}$.

- What is the average velocity of the object from $t = 1$ to $t = 3$?
- What is the average velocity of the object from $t = 1$ to $t = 5$?
- What is the average velocity of the object from $t = 2$ to $t = 5$?
- What is the instantaneous velocity of the object at $t = 2$?
- What is the instantaneous velocity of the object at $t = 4$?

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

- Find the slope of the secant line to the graph of f passing through the points at $x = 2$ and $x = 4$.
- Find the slope of the secant line to the graph of f passing through the points at $x = 2$ and $x = 5$.
- Find the slope of the tangent line to the graph of f at the point with $x = 2$.
- Find the slope of the tangent line to the graph of f at the point with $x = 4$.
- Find the equation (in $y = mx + b$ form) of the tangent line to the graph of f at the point with $x = 2$.
- Find the equation (in $y = mx + b$ form) of the tangent line to the graph of f at the point with $x = 4$.

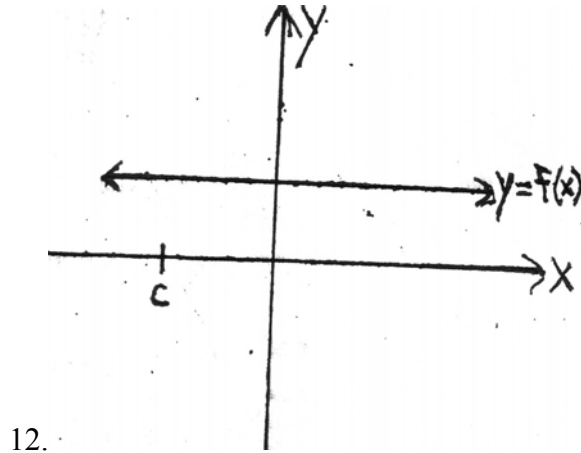
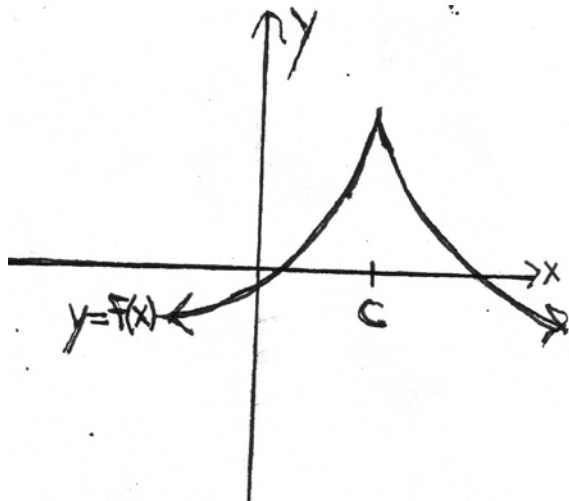
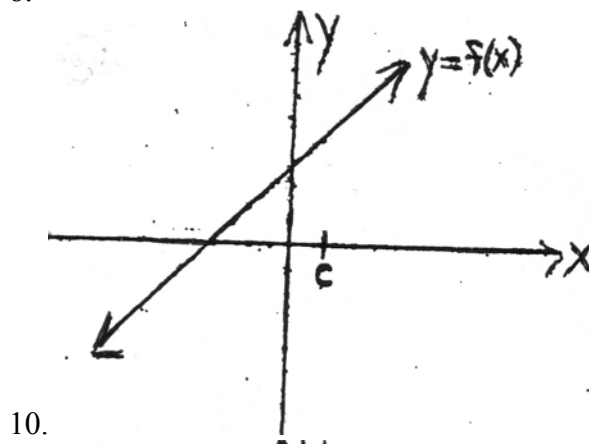
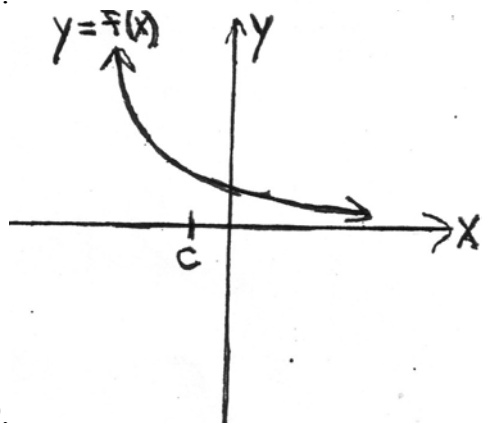
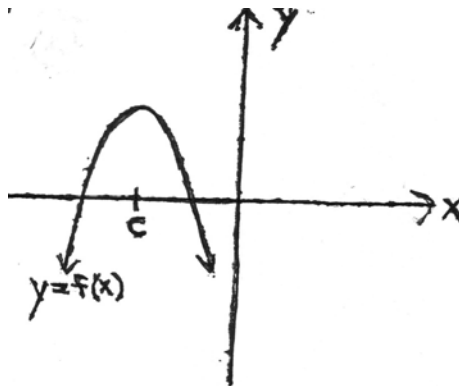
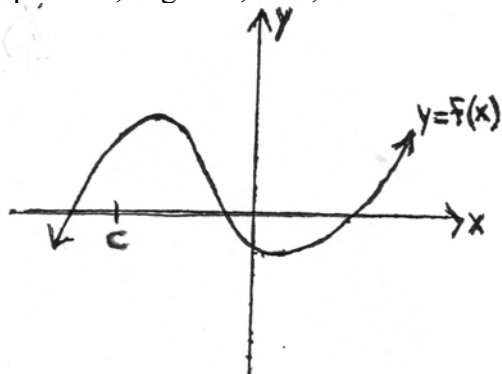
5. $f(x) = \frac{1}{3x} - 4$

- Find the slope of the secant line to the graph of f passing through the points at $x = 2$ and $x = 4$.
- Find the slope of the secant line to the graph of f passing through the points at $x = \frac{1}{6}$ and $x = \frac{1}{3}$.
- Find the slope of the tangent line to the graph of f at the point with $x = 2$.
- Find the slope of the tangent line to the graph of f at the point with $x = \frac{1}{3}$.
- Find the equation (in $y = mx + b$ form) of the tangent line to the graph of f at the point with $x = 2$.
- Find the equation (in $y = mx + b$ form) of the tangent line to the graph of f at the point with $x = \frac{1}{3}$.

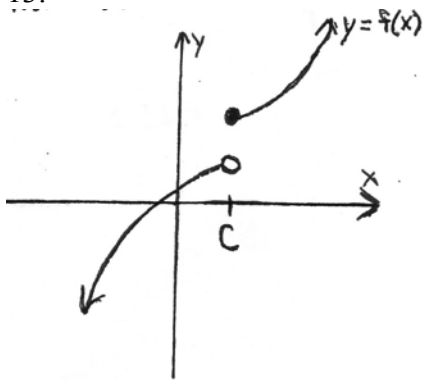
6. $f(x) = \sqrt{3x}$

- Find the slope of the secant line to the graph of f passing through the points at $x = 3$ and $x = 12$.
- Find the slope of the secant line to the graph of f passing through the points at $x = 3$ and $x = 27$.
- Find the slope of the tangent line to the graph of f at the point with $x = 3$.
- Find the slope of the tangent line to the graph of f at the point with $x = 12$.
- Find the equation (in $y = mx + b$ form) of the tangent line to the graph of f at the point with $x = 3$.
- Find the equation (in $y = mx + b$ form) of the tangent line to the graph of f at the point with $x = 12$.

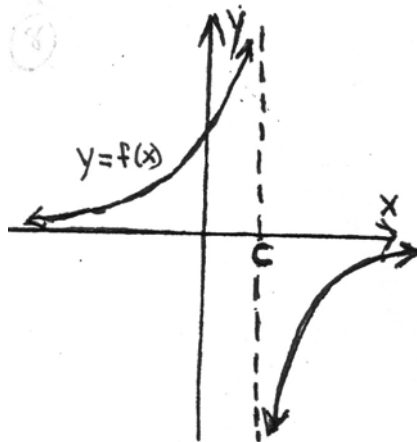
For problems 7-15, draw the tangent line to the graph of $y = f(x)$ at $x = c$. Also, for each, classify $f'(c)$ as positive, negative, zero, or nonexistent.



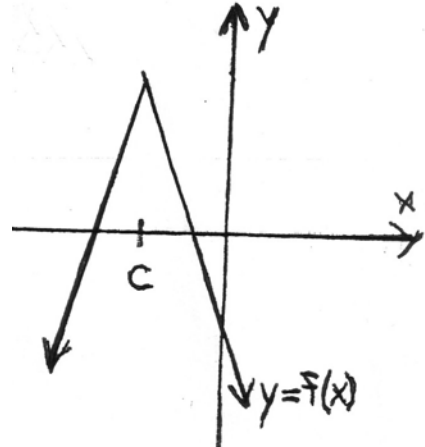
13.



14.



15.

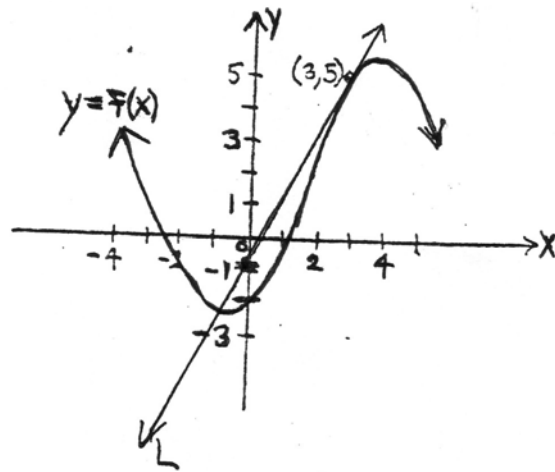


16. Line L is tangent to the curve $y = f(x)$ at the point $(3, 5)$. Find:

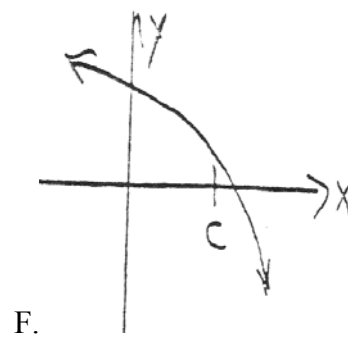
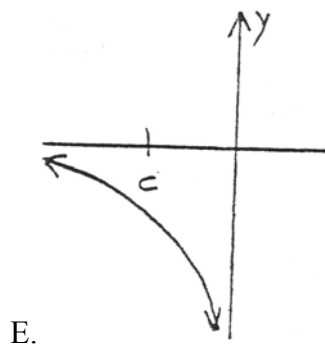
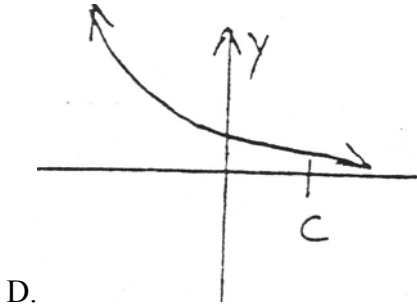
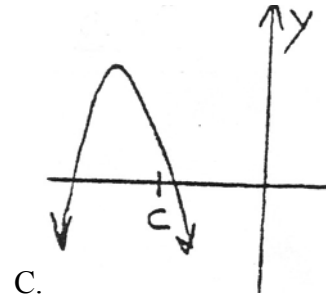
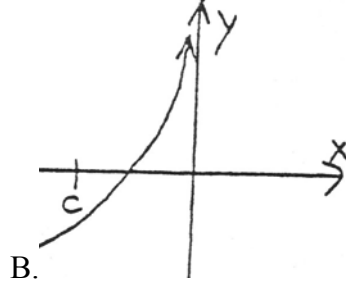
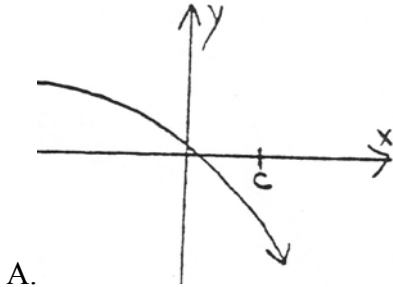
a) $f(3)$

b) $f'(3)$

c) $f(0)$

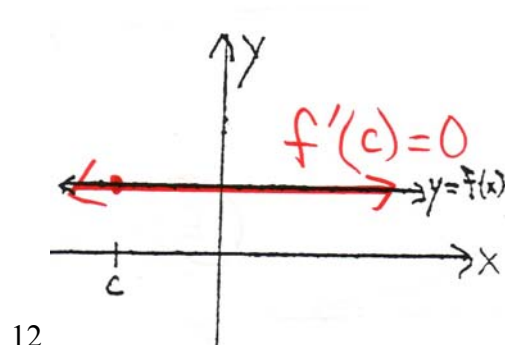
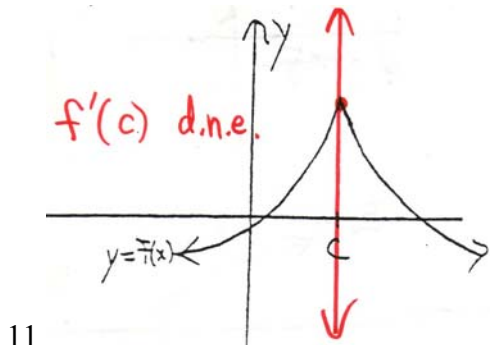
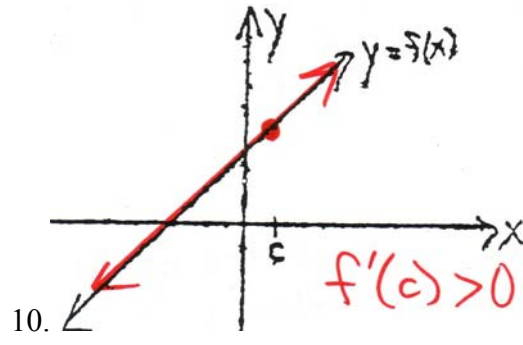
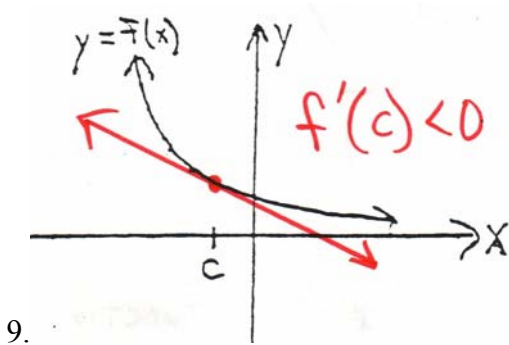
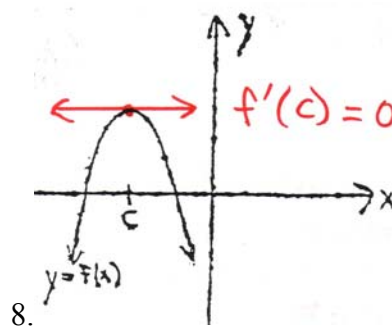
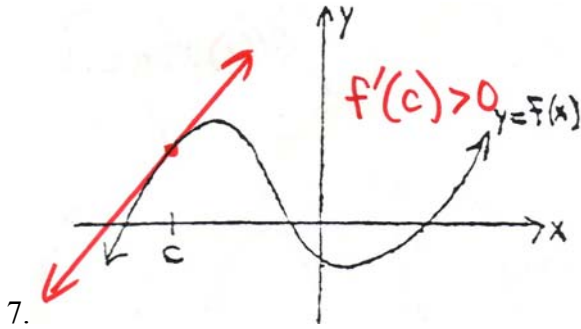


17. Multiple Choice. Indicate which one of the graphs below could depict a function f that has the following properties: $c < 0$, $f(c) < 0$, and $f'(c) < 0$.



ANSWERS

- 1a) 9 m/s 1b) 15 m/s 1c) 21 m/s 1d) 12 m/s 1e) 30 m/s
- 2a) $\frac{1}{2}$ m/s 2b) $\frac{1}{3}$ m/s 2c) $\frac{1}{7}$ m/s 2d) $\frac{1}{6}$ m/s 2e) $\frac{1}{8}$ m/s
- 3a) $-\frac{2}{3}$ m/s 3b) $-\frac{2}{5}$ m/s 3c) $-\frac{1}{5}$ m/s 3d) $-\frac{1}{2}$ m/s 3e) $-\frac{1}{8}$ m/s
- 4a) 13 4b) 16 4c) 7 4d) 19 4e) $y = 7x - 10$ 4f) $y = 19x - 46$
- 5a) $-\frac{1}{24}$ 5b) -6 5c) $-\frac{1}{12}$ 5d) -3 5e) $y = -\frac{1}{12}x - \frac{11}{3}$ 5f) $y = -3x - 2$
- 6a) $\frac{1}{3}$ 6b) $\frac{1}{4}$ 6c) $\frac{1}{2}$ 6d) $\frac{1}{4}$ 6e) $y = \frac{1}{2}x + \frac{3}{2}$ 6f) $y = \frac{1}{4}x + 3$



13. No tangent line. $f'(c)$ d.n.e. 14. No tangent line. $f'(c)$ d.n.e. 15. No tangent line. $f'(c)$ d.n.e.
 16a) 5 16b) 2 16c) -2 17) E