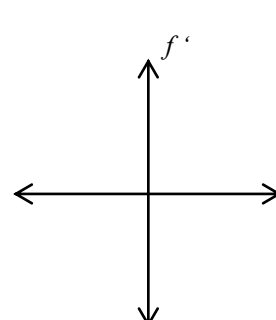
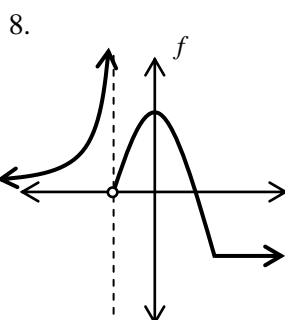
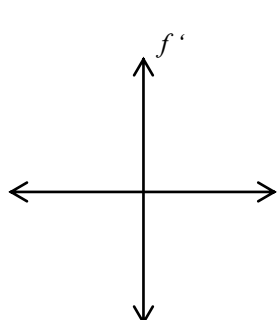
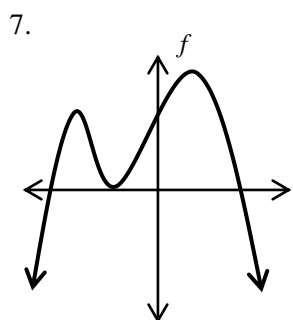
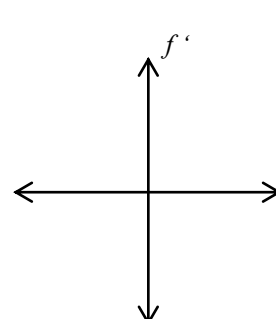
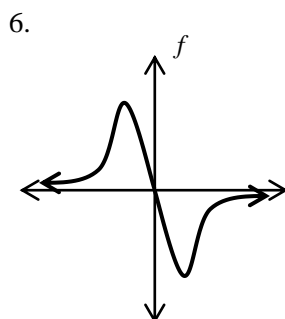
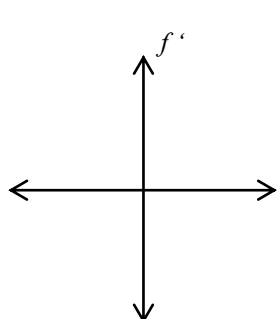
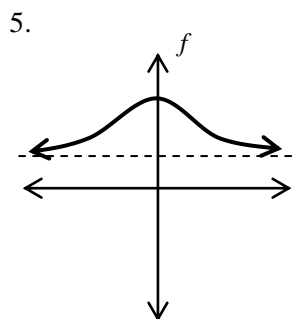
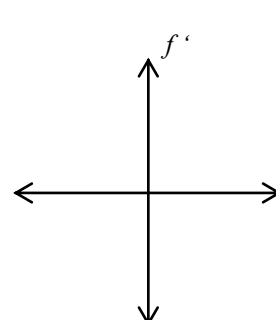
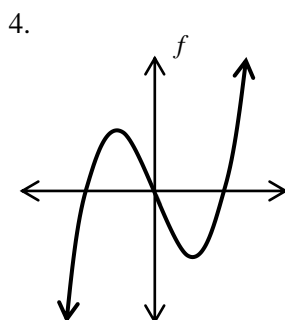
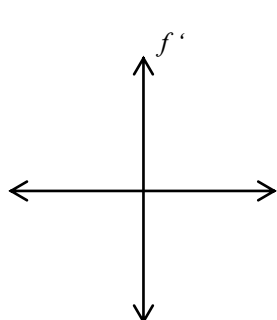
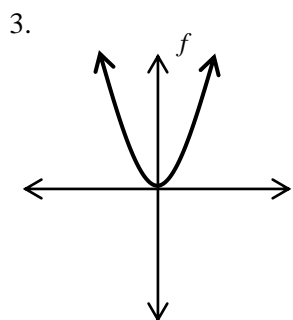
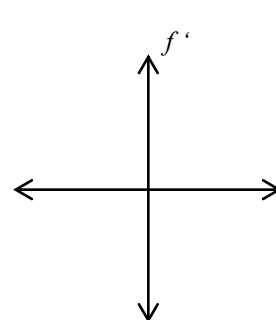
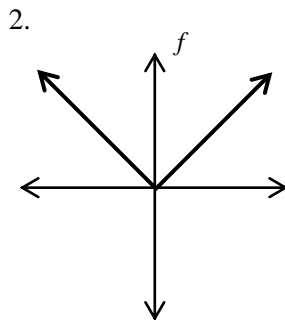
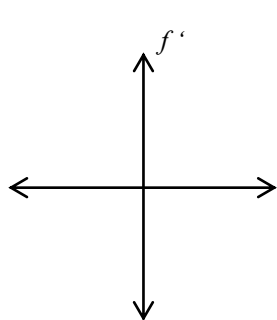
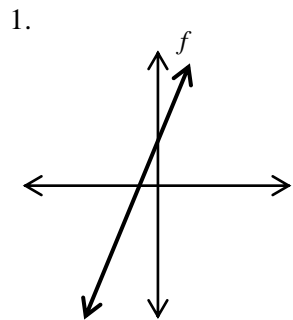


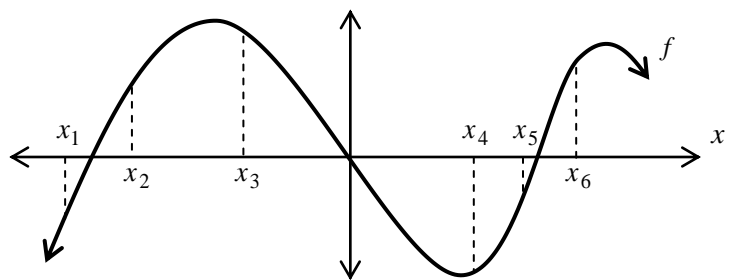
Sketching the Derivative Function; Differentiability; Application of the Derivative - Velocity

Sketch the graph of $f'(x)$. Sketch directly on $f(x)$ or on the coordinate axes of $f'(x)$.



9. The graph of the derivative of $f(x) = 2x + 3$ is
- (A) a horizontal line
 - (B) a vertical line
 - (C) a line with a positive slope
 - (D) a line with a negative slope
 - (E) a parabola
10. The graph of the derivative of $f(x) = x^2$ is
- (A) a horizontal line
 - (B) a vertical line
 - (C) a line with a positive slope
 - (D) a line with a negative slope
 - (E) a line with a y-intercept 2
11. If the average rate of change of a function on $[a, b]$ is zero, then the graph of the function
- (A) can be a line with a positive slope
 - (B) can be a quadratic
 - (C) cannot be a horizontal line
 - (D) can be a line with a negative slope
 - (E) is a vertical line
12. The average rate of change of $f(x) = mx + b$ on the interval $[a, c]$ is
- (A) 0
 - (B) 1
 - (C) m
 - (D) $m(c - a)$
 - (E) $\frac{mc - ma + 2b}{c - a}$
13. If $f(x)$ is an even polynomial function, then $f'(x)$ is
- (A) even
 - (B) odd
 - (C) linear
 - (D) quadratic
 - (E) never odd or even
14. If $f(x)$ is an odd polynomial function, then $f'(x)$ is
- (A) even
 - (B) odd
 - (C) linear
 - (D) quadratic
 - (E) never odd or even

Use the figure on the right to answer #15.



At which of the labeled x values is

15. $f(x)$ greatest?

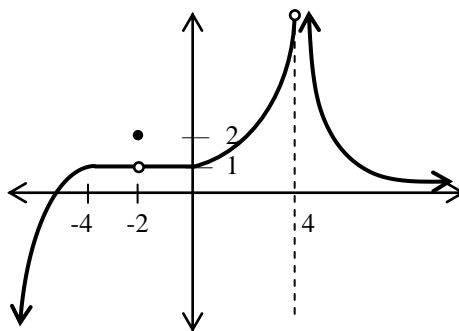
16. $f(x)$ least?

17. $f'(x)$ greatest?

18. $f'(x)$ least?

19. Identify the points where $f(x)$ is not differentiable.

$$f(x) = \begin{cases} -(x+4)^2 + 1, & x \leq -4 \\ 1, & -4 < x < -2 \\ 2, & x = -2 \\ 1, & -2 < x \leq 0 \\ e^x, & 0 < x < 4 \\ \frac{1}{(x-4)}, & x > 4 \end{cases}$$



20. Show that $f(x) = \sqrt[3]{x}$ has a vertical tangent, and therefore not differentiable, at $x = 0$.

The following table represents the height of an object in feet at t seconds.

t	0	1	2	3	4
$f(t)$	1.2	3.2	8.9	5.0	3.8

21. Find the average velocity from 0 to 2 seconds.

22. Find the instantaneous velocity at 1 second.

23. Find the instantaneous velocity at 4 seconds.

24. Find the instantaneous velocity at 2.5 second.

A ball is tossed in the air from a bridge, and its height, y (in feet), above the ground t seconds after it is thrown is given by the equation $y = f(t) = -16t^2 + 50t + 36$.

25. What is the average velocity of the ball for the first two seconds?

26. What is the instantaneous velocity of the ball at 1 second?

27. What is the speed of the ball at 3 seconds?

28. What is the maximum height of the ball?
(Hint: Use what you know about parabolas or about the value of $f'(t)$ when $f(t)$ is at a max.)

ANSWERS:

- | | | | |
|-------|--------------|---------------|----------------|
| 9) A | 14) A | 21) 3.85 ft/s | 27) 46 ft/s |
| 10) C | 15) x_3 | 22) 3.85 ft/s | 28) 75.0625 ft |
| 11) B | 16) x_4 | 23) -1.2 ft/s | |
| 12) C | 17) x_5 | 24) -3.9 ft/s | |
| 13) B | 18) x_3 | 25) 18 ft/s | |
| 14) A | 19) -2, 0, 4 | 26) 18 ft/s | |