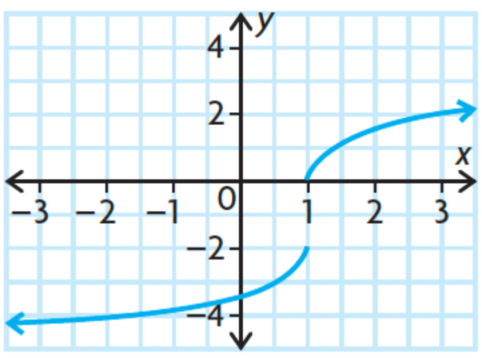
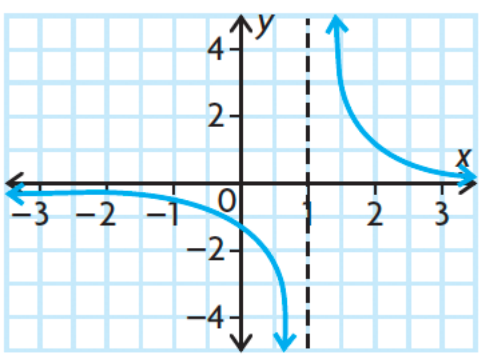
Section 2.1, pp. 73–75

1. **a.** $\{x \in \mathbf{R} \mid x \neq -2\}$
b. $\{x \in \mathbf{R} \mid x \neq 2\}$
c. $\{x \in \mathbf{R}\}$
d. $\{x \in \mathbf{R} \mid x \neq 1\}$
e. $\{x \in \mathbf{R}\}$
f. $\{x \in \mathbf{R} \mid x > 2\}$

2. The derivative of a function represents the slope of the tangent line at a give value of the independent variable or the instantaneous rate of change of the function at a given value of the independent variable.

3. Answers may vary. For example:





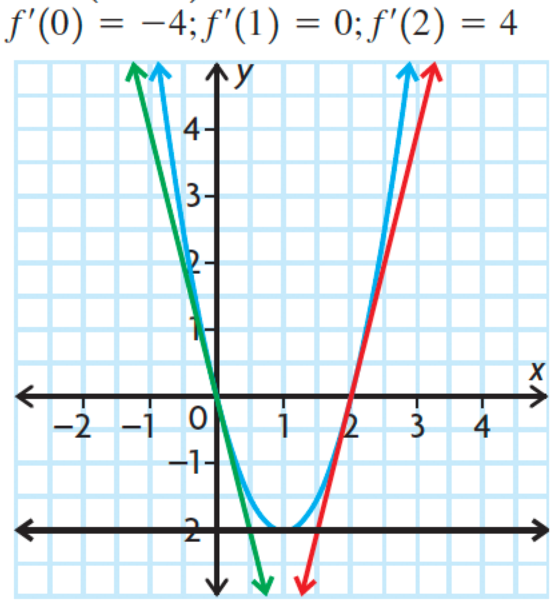
4. **a.** $5a + 5h - 2$; $5h$
b. $a^2 + 2ah + h^2 + 3a + 3h - 1$; $2ah + h^2 + 3h$
c. $a^3 + 3a^2h + 3ah^2 + h^3 - 4a - 4h + 1$; $3a^2h + 3ah^2 + h^3 - 4h$
d. $a^2 + 2ah + h^2 + a + h - 6$; $2ah + h^2 + h$
e. $-7a - 7h + 4$; $-7h$
f. $4 - 2a - 2h - a^2 - 2ah - h^2$; $-2h - h^2 - 2ah$

5. **a.** 2 **c.** $\frac{1}{2}$
b. 9 **d.** -5

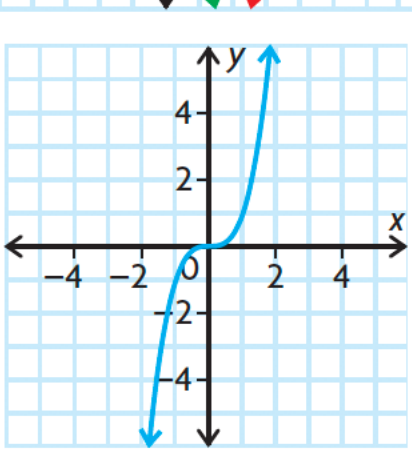
6. **a.** -5 **c.** $18x^2 - 7$
b. $4x + 4$ **d.** $\frac{3}{2\sqrt{3x+2}}$

7. **a.** -7
b. $-\frac{2}{(x-1)^2}$ **c.** $6x$

8. $f'(0) = -4$; $f'(1) = 0$; $f'(2) = 4$

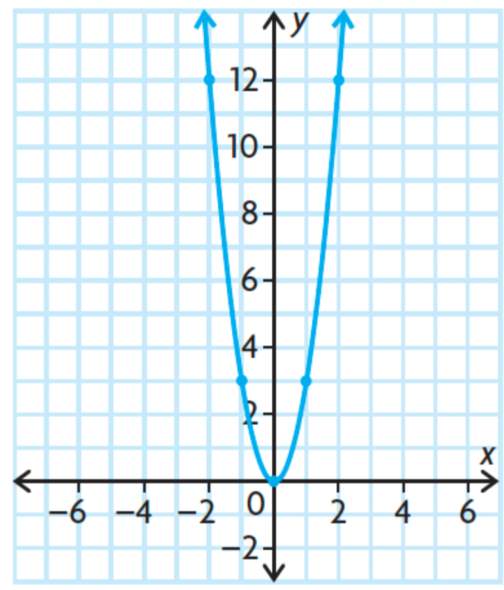


9. **a.**



b. $f'(-2) = 12$; $f'(-1) = 3$; $f'(0) = 0$; $f'(1) = 3$; $f'(2) = 12$

c.



d. graph of $f(x)$ is cubic; graph of $f'(x)$ seems to be a parabola

10. $s'(0) = 8$ m/s; $s'(4) = 0$ m/s; $s'(6) = -4$ m/s

11. $x - 6y + 10 = 0$

12. **a.** 0 **c.** m
b. 1 **d.** $2ax + b$

13. Since $3x^2$ is nonnegative for all x, the original function never has a negative slope.

14. **a.** -1.6 m/s
b. $h'(2)$ measures the rate of change in the height of the ball with respect to time when $t = 2$.

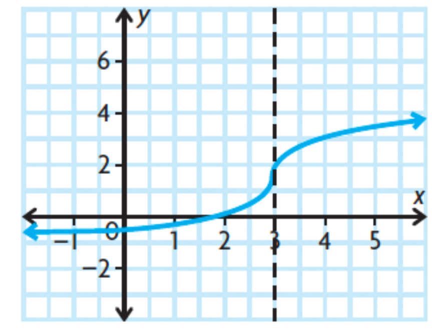
15. **a.** e. **b.** f. **c.** d.

16.
$$\lim_{h\to 0^-} \frac{f(0+h) - f(0)}{h}$$
$$= \lim_{h\to 0^-} \frac{-(0+h)^2 - (-0^2)}{h}$$
$$= \lim_{h\to 0^-} \frac{-h^2}{h}$$
$$= \lim_{h\to 0^-} (-h)$$
$$= 0$$
$$\lim_{h\to 0^+} \frac{f(0+h) - f(0)}{h}$$
$$= \lim_{h\to 0^+} \frac{(0+h)^2 - (0^2)}{h}$$
$$= \lim_{h\to 0^+} \frac{h^2}{h}$$
$$= \lim_{h\to 0^+} (h)$$
$$= 0$$

Since the limits are equal for both sides, the derivative exists and $f'(0) = 0$.

17. 3

18. Answers may vary. For example:



19. $(3, -8)$

20. $2x + y + 1 = 0$ and $6x - y - 9 = 0$