Section 1.2

Find the limits.

3. $\lim_{x \to 2} x(x-1)(x+1)$

4. $\lim_{x \to 3} x^3 - 3x^2 + 9x$

5. $\lim_{x \to 3} \dfrac{x^2 - 2x}{x+1}$

6. $\lim_{x \to 0} \dfrac{6x - 9}{x^3 - 12x + 3}$

7. $\lim_{x \to 1^+} \dfrac{x^4 - 1}{x - 1}$

8. $\lim_{t \to -2} \dfrac{t^3 + 8}{t + 2}$

9. $\lim_{x \to -1} \dfrac{x^2 + 6x + 5}{x^2 - 3x - 4}$

10. $\lim_{x \to 2} \dfrac{x^2 - 4x + 4}{x^2 + x - 6}$

Section 1.3

9–32 Find the limits. ■

9. $\lim_{x \to +\infty} (1 + 2x - 3x^5)$

10. $\lim_{x \to +\infty} (2x^3 - 100x + 5)$

11. $\lim_{x \to +\infty} \sqrt{x}$

12. $\lim_{x \to -\infty} \sqrt{5 - x}$

13. $\lim_{x \to +\infty} \dfrac{3x + 1}{2x - 5}$

14. $\lim_{x \to +\infty} \dfrac{5x^2 - 4x}{2x^2 + 3}$

15. $\lim_{y \to -\infty} \dfrac{3}{y + 4}$

16. $\lim_{x \to +\infty} \dfrac{1}{x - 12}$

17. $\lim_{x \to -\infty} \dfrac{x - 2}{x^2 + 2x + 1}$

18. $\lim_{x \to +\infty} \dfrac{5x^2 + 7}{3x^2 - x}$

19. $\lim_{x \to +\infty} \dfrac{7 - 6x^5}{x + 3}$

20. $\lim_{t \to -\infty} \dfrac{5 - 2t^3}{t^2 + 1}$

21. $\lim_{t \to +\infty} \dfrac{6 - t^3}{7t^3 + 3}$

22. $\lim_{x \to -\infty} \dfrac{x + 4x^3}{1 - x^2 + 7x^3}$

Section 1.5

11–22 Find values of x, if any, at which f is not continuous.

11. $f(x) = 5x^4 - 3x + 7$

12. $f(x) = \sqrt[3]{x - 8}$

13. $f(x) = \dfrac{x + 2}{x^2 + 4}$

14. $f(x) = \dfrac{x + 2}{x^2 - 4}$

15. $f(x) = \dfrac{x}{2x^2 + x}$

16. $f(x) = \dfrac{2x + 1}{4x^2 + 4x + 5}$

17. $f(x) = \dfrac{3}{x} + \dfrac{x - 1}{x^2 - 1}$

18. $f(x) = \dfrac{5}{x} + \dfrac{2x}{x + 4}$

29–30 Find a value of the constant k, if possible, that will make the function continuous everywhere.

29. (a) $f(x) = \begin{cases} 7x - 2, & x \le 1 \\ kx^2, & x > 1 \end{cases}$

(b) $f(x) = \begin{cases} kx^2, & x \le 2 \\ 2x + k, & x > 2 \end{cases}$

30. (a) $f(x) = \begin{cases} 9 - x^2, & x \ge -3 \\ k/x^2, & x < -3 \end{cases}$

(b) $f(x) = \begin{cases} 9 - x^2, & x \ge 0 \\ k/x^2, & x < 0 \end{cases}$ (optional)

Section 1.6

13. $\lim_{\theta \to 0} \dfrac{\sin 3\theta}{\theta}$

14. $\lim_{h \to 0} \dfrac{\sin h}{2h}$

15. $\lim_{x \to 0} \dfrac{x^2 - 3\sin x}{x}$

20. $\lim_{x \to 0} \dfrac{\sin 6x}{\sin 8x}$

Chapter 2

Section 2.2

9–14 Use Definition 2.2.1 to find $f'(x)$, and then find the tangent line to the graph of $y = f(x)$ at $x = a$. ■

9. $f(x) = 2x^2;\ a = 1$

10. $f(x) = 1/x^2;\ a = -1$

11. $f(x) = x^3;\ a = 0$

12. $f(x) = 2x^3 + 1;\ a = -1$

Find the derivatives using the definition of derivative.

15. $y = \dfrac{1}{x}$

16. $y = \dfrac{1}{x+1}$

17. $y = x^2 - x$

Section 2.3

9–16 Find $f'(x)$. ■

9. $f(x) = x^{-3} + \dfrac{1}{x^7}$

10. $f(x) = \sqrt{x} + \dfrac{1}{x}$

11. $f(x) = -3x^{-8} + 2\sqrt{x}$

12. $f(x) = 7x^{-6} - 5\sqrt{x}$

Section 2.4

5–20 Find $f'(x)$. ■

5. $f(x) = (3x^2 + 6)\left(2x - \frac{1}{4}\right)$

6. $f(x) = (2 - x - 3x^3)(7 + x^5)$

7. $f(x) = (x^3 + 7x^2 - 8)(2x^{-3} + x^{-4})$

11. $f(x) = \dfrac{3x + 4}{x^2 + 1}$

12. $f(x) = \dfrac{x - 2}{x^4 + x + 1}$

13. $f(x) = \dfrac{x^2}{3x - 4}$

14. $f(x) = \dfrac{2x^2 + 5}{3x - 4}$

Section 2.5

1–18 Find $f'(x)$. ■

1. $f(x) = 4\cos x + 2\sin x$

2. $f(x) = \dfrac{5}{x^2} + \sin x$

3. $f(x) = -4x^2 \cos x$

4. $f(x) = 2\sin^2 x$

5. $f(x) = \dfrac{5 - \cos x}{5 + \sin x}$

6. $f(x) = \dfrac{\sin x}{x^2 + \sin x}$

7. $f(x) = \sec x - \sqrt{2}\tan x$

8. $f(x) = (x^2 + 1)\sec x$

Section 2.6

7–26 Find $f'(x)$. ■

7. $f(x) = (x^3 + 2x)^{37}$

8. $f(x) = (3x^2 + 2x - 1)^6$

15. $f(x) = \sin\left(\dfrac{1}{x^2}\right)$

16. $f(x) = \tan\sqrt{x}$

23. $f(x) = \sqrt{\cos(5x)}$

Section 2.7

1–2

(a) Find dy/dx by differentiating implicitly.

(b) Solve the equation for y as a function of x, and find dy/dx from that equation.

1. $x + xy - 2x^3 = 2$

2. $\sqrt{y} - \sin x = 2$

19–20 Find the slope of the tangent line to the curve at the given points

19. $x^2 + y^2 = 1;\ (1/2, \sqrt{3}/2), (1/2, -\sqrt{3}/2)$

20. $y^2 - x + 1 = 0;\ (10, 3), (10, -3)$

Section 2.8

3. (a) Find the local linear approximation of the function $f(x) = \sqrt{1 + x}$ at $x_0 = 0$, and use it to approximate $\sqrt{0.9}$ and $\sqrt{1.1}$.