Lesson 5-8

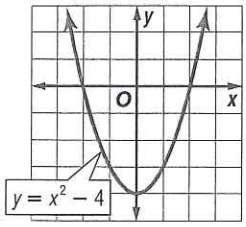
(pages 294–301)

Graph each inequality.

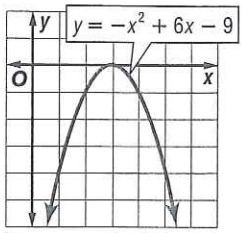
1. $y \leq 5x^2 + 3x - 2$
2. $y > -3x^2 + 2$
3. $y \geq x^2 - 8x$
4. $y \geq -x^2 - x + 3$
5. $y \leq 3x^2 + 4x - 8$
6. $y \leq -5x^2 + 2x - 3$
7. $y > 4x^2 + x$
8. $y \geq -x^2 - 3$

Use the graph of the related function of each inequality to write its solutions.

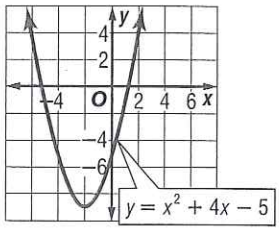
9. $x^2 - 4 \leq 0$



10. $-x^2 + 6x - 9 \geq 0$



11. $x^2 + 4x - 5 < 0$



Solve each inequality algebraically.

12. $x^2 - 1 < 0$
13. $10x^2 - x - 2 \geq 0$
14. $-x^2 - 5x - 6 > 0$
15. $-3x^2 \geq 5$
16. $x^2 - 2x - 8 \leq 0$
17. $2x^2 \geq 5x + 12$
18. $x^2 + 3x - 4 > 0$
19. $2x - x^2 \leq -15$

Lesson 6-1

(pages 312–318)

Simplify. Assume that no variable equals 0.

1. $x^7 \cdot x^3 \cdot x$
2. $m^8 \cdot m \cdot m^{10}$
3. $7^5 \cdot 7^2$
4. $(-3)^4(-3)$
5. $\frac{t^{12}}{t}$
6. $-\frac{16x^8}{8x^2}$
7. $\frac{6^5}{6^3}$
8. $\frac{p^5q^7}{p^2q^5}$
9. $-(m^3)^8$
10. $(3^5)^7$
11. -3^4
12. $(abc)^3$
13. $(x^2)^5$
14. $(b^4)^6$
15. $(-2y^5)^2$
16. $3x^0$
17. $(5x^4)^{-2}$
18. $(-3)^{-2}$
19. -3^{-2}
20. $\frac{x}{x^7}$
21. $-\left(\frac{x}{5}\right)^2$
22. $\left(\frac{5a^7}{2b^5c}\right)^3$
23. $\frac{1}{x^{-3}}$
24. $\frac{5^6a^{x+y}}{5^4a^{x-y}}$

Evaluate. Express the result in scientific notation.

25. $(8.95 \times 10^9)(1.82 \times 10^7)$
26. $(3.1 \times 10^5)(7.9 \times 10^{-8})$
27. $\frac{(2.38 \times 10^{13})(7.56 \times 10^{-5})}{(4.2 \times 10^{18})}$

Lesson 6-2

(pages 320–324)

Simplify.

1. $(4x^3 + 5x - 7x^2) + (-2x^3 + 5x^2 - 7y^2)$
2. $(2x^2 - 3x + 11) + (7x^2 + 2x - 8)$
3. $(-3x^2 + 7x + 23) + (-8x^2 - 5x + 13)$
4. $(-3x^2 + 7x + 23) - (-8x^2 - 5x + 13)$
5. $\frac{7}{uw}\left(4u^2w^3 - 5uw + \frac{w}{7u}\right)$
6. $-4x^5(-3x^4 - x^3 + x + 7)$
7. $(2x - 3)(4x + 7)$
8. $(3x - 5)(-2x - 1)$
9. $(3x - 5)(2x - 1)$
10. $(2x + 5)(2x - 5)$
11. $(3x - 7)(3x + 7)$
12. $(5 + 2w)(5 - 2w)$
13. $(2a^2 + 8)(2a^2 - 8)$
14. $(-5x + 10)(-5x - 10)$
15. $(4x - 3)^2$
16. $(5x + 6)^2$
17. $(-x + 1)^2$
18. $\frac{3}{4}x(x^2 + 4x + 14)$
19. $-\frac{1}{2}a^2(a^3 - 6a^2 + 5a)$

Lesson 6-3

(pages 325–330)

Find $p(5)$ and $p(-1)$ for each function.

1. $p(x) = 7x - 3$
2. $p(x) = -3x^2 + 5x - 4$
3. $p(x) = 5x^4 + 2x^2 - 2x$
4. $p(x) = -13x^3 + 5x^2$
5. $p(x) = x^6 - 2$
6. $p(x) = \frac{2}{3}x^2 + 5x$
7. $p(x) = x^3 + x^2 - x + 1$
8. $p(x) = x^4 - x^2 - 1$
9. $p(x) = 1 - x^3$

If $p(x) = -2x^2 + 5x + 1$ and $q(x) = x^3 - 1$, find each value.

10. $q(n)$
11. $p(2b)$
12. $q(z^3)$
13. $p(3m^2)$
14. $q(x + 1)$
15. $p(3 - x)$
16. $q(a^2 - 2)$
17. $3q(h - 3)$
18. $5[p(c - 4)]$
19. $q(n - 2) + q(n^2)$
20. $-3p(4a) - p(a)$
21. $2[q(d^2 + 1)] + 3q(d)$

Lesson 6-4

(pages 331–338)

For Exercises 1–16, complete each of the following.

a. **Graph each function by making a table of values.**

b. **Determine the values of x between which the real zeros are located.**

c. **Estimate the x-coordinates at which the relative maxima and relative minima occur.**

1. $f(x) = x^3 + x^2 - 3x$
2. $f(x) = -x^4 + x^3 + 5$
3. $f(x) = x^3 - 3x^2 + 8x - 7$
4. $f(x) = 2x^5 + 3x^4 - 8x^2 + x + 4$
5. $f(x) = x^4 - 5x^3 + 6x^2 - x - 2$
6. $f(x) = 2x^6 + 5x^4 - 3x^2 - 5$
7. $f(x) = -x^3 - 8x^2 + 3x - 7$
8. $f(x) = -x^4 - 3x^3 + 5x$
9. $f(x) = x^5 - 7x^4 - 3x^3 + 2x^2 - 4x + 9$
10. $f(x) = x^4 - 5x^3 + x^2 - x - 3$
11. $f(x) = x^4 - 128x^2 + 960$
12. $f(x) = -x^5 + x^4 - 208x^2 + 145x + 9$
13. $f(x) = x^5 - x^3 - x + 1$
14. $f(x) = x^3 - 2x^2 - x + 5$
15. $f(x) = 2x^4 - x^3 + x^2 - x + 1$
16. $f(x) = -x^3 - x^2 - x - 1$

Lesson 6-5

(pages 339–345)

Factor completely. If the polynomial is not factorable, write *prime*.

1. $14a^3b^3c - 21a^2b^4c + 7a^2b^3c$
2. $10ax - 2xy - 15ab + 3by$
3. $x^2 + x - 42$
4. $2x^2 + 5x + 3$
5. $6x^2 + 71x - 12$
6. $6x^4 - 12x^3 + 3x^2$
7. $x^2 - 6x + 2$
8. $x^2 - 2x - 15$
9. $6x^2 + 23x + 20$
10. $24x^2 - 76x + 40$
11. $6p^2 - 13pq - 28q^2$
12. $2x^2 - 6x + 3$
13. $x^2 + 49 - 14x$
14. $9x^2 - 64$
15. $36 - t^{10}$
16. $x^2 + 16$
17. $a^4 - 81b^4$
18. $3a^3 + 12a^2 - 63a$
19. $x^3 - 8x^2 + 15x$
20. $x^2 + 6x + 9$
21. $18x^3 - 8x$
22. $3x^2 - 42x + 40$
23. $2x^2 + 4x - 1$
24. $2x^3 + 6x^2 + x + 3$
25. $35ac - 3bd - 7ad + 15bc$
26. $5h^2 - 10hj + h - 2j$

Simplify. Assume that no denominator is equal to 0.

27. $\frac{x^2 + 8x + 15}{x^2 + 4x + 3}$
28. $\frac{x^2 + x - 2}{x^2 - 6x + 5}$
29. $\frac{x^2 - 15x + 56}{x^2 - 4x - 21}$
30. $\frac{x^2 + x - 6}{x^3 + 9x^2 + 27x + 27}$

Lesson 6-6

(pages 349–355)

Simplify.

1. $\frac{18r^3s^2 + 36r^2s^3}{9r^2s^2}$
2. $\frac{15v^3w^2 - 5v^4w^3}{-5v^4w^3}$
3. $\frac{x^2 - x + 1}{x}$
4. $(5bh + 5ch) \div (b + c)$
5. $(25c^4d + 10c^3d^2 - cd) \div 5cd$
6. $(16f^{18} + 20f^9 - 8f^6) \div 4f^3$
7. $(33m^5 + 55mn^5 - 11m^3)(11m)^{-1}$
8. $(8g^3 + 19g^2 - 12g + 9) \div (g + 3)$
9. $(p^{21} + 3p^{14} + p^7 - 2)(p^7 + 2)^{-1}$
10. $(8k^2 - 56k + 98) \div (2k - 7)$
11. $(2r^2 + 5r - 3) \div (r + 3)$
12. $(n^3 + 125) \div (n + 5)$
13. $(10y^4 + 3y^2 - 7) \div (2y^2 - 1)$
14. $(q^4 + 8q^3 + 3q + 17) \div (q + 8)$
15. $(15v^3 + 8v^2 - 21v + 6) \div (5v - 4)$
16. $(-2x^3 + 15x^2 - 10x + 3) \div (x + 3)$
17. $(5s^3 + s^2 - 7) \div (s + 1)$
18. $(t^4 - 2t^3 + t^2 - 3t + 2) \div (t - 2)$
19. $(z^4 - 3z^3 - z^2 - 11z - 4) \div (z - 4)$
20. $(3r^4 - 6r^3 - 2r^2 + r - 6) \div (r + 1)$
21. $(2b^3 - 11b^2 + 12b + 9) \div (b - 3)$

Lesson 6-7

(pages 356–361)

Use synthetic substitution to find $f(3)$ and $f(-4)$ for each function.

1. $f(x) = x^2 - 6x + 2$
2. $f(x) = x^3 + 5x - 6$
3. $f(x) = x^3 - x^2 - 3x + 1$
4. $f(x) = -3x^3 + 5x^2 + 7x - 3$
5. $f(x) = 3x^5 - 5x^3 + 2x - 8$
6. $f(x) = 10x^3 + 2$

Given a polynomial and one of its factors, find the remaining factors of the polynomial. Some factors may not be binomials.

7. $(x^3 - x^2 + x + 14); (x + 2)$
8. $(5x^3 - 17x^2 + 6x); (x - 3)$
9. $(2x^3 + x^2 - 41x + 20); (x - 4)$
10. $(x^3 - 8); (x - 2)$
11. $(x^2 + 6x + 5); (x + 1)$
12. $(x^4 + x^3 + x^2 + x); (x + 1)$
13. $(x^3 - 8x^2 + x + 42); (x - 7)$
14. $(x^4 + 5x^3 - 27x - 135); (x - 3)$
15. $(2x^3 - 15x^2 - 2x + 120); (2x + 5)$
16. $(6x^3 - 17x^2 + 6x + 8); (3x - 4)$
17. $(10x^3 + x^2 - 46x + 35); (5x - 7)$
18. $(x^3 + 9x^2 + 23x + 15); (x + 1)$

Lesson 6-8

(pages 362–368)

Solve each equation. State the number and type of roots.

1. $-5x - 7 = 0$
2. $3x^2 + 10 = 0$
3. $x^4 - 2x^3 = 23x^2 - 60x$

State the number of positive real zeros, negative real zeros, and imaginary zeros for each function.

4. $f(x) = 5x^8 - x^6 + 7x^4 - 8x^2 - 3$
5. $f(x) = 6x^5 - 7x^2 + 5$
6. $f(x) = -2x^6 - 5x^5 + 8x^2 - 3x + 1$
7. $f(x) = 4x^3 + x^2 - 38x + 56$
8. $f(x) = 3x^4 - 5x^3 + 2x^2 - 7x + 5$
9. $f(x) = x^5 - x^4 + 7x^3 - 25x^2 + 8x - 13$

Find all of the zeros of the function.

10. $f(x) = x^3 - 7x^2 + 16x - 10$
11. $f(x) = 10x^3 + 7x^2 - 82x + 56$
12. $f(x) = x^3 - 16x^2 + 79x - 114$
13. $f(x) = -3x^3 + 6x^2 + 5x - 8$
14. $f(x) = 24x^3 + 64x^2 + 6x - 10$
15. $f(x) = 2x^3 + 2x^2 - 34x + 30$