NAME _____ DATE _____

Practice

Student Edition
Pages 254–260

Monomials

Simplify. Assume that no variable equals 0.

1. $3n^2v^3 - n^2v^3 + 8v^3n^2$

2. $4r^6w^2 + 9r^2w^6 - r^6w^2$

3. $y^7 \cdot y^3 \cdot y^2$

4. $(n^6)^3$

5. $(2n)^4 + 2n^4$

6. $\frac{12m^8y^6}{-9my^4}$

7. $(4a^3c^2)^3(-3ac^4)^2$

8. $\left(\frac{3}{2}e^2f^4\right)^4\left(-\frac{4}{3}e^5f\right)^3\left(-\frac{1}{6}ef^5\right)$

9. $-5v^2(2r^3v^2)(rv^3) - (-r^2)(16r^2v^7)$

10. $(-n)^4(2xy^2n)^3 + (4xy^3n^2)^2(-3xn^3)$

11. $\frac{(3x^{-2}y^3)(5xy^{-8})}{(x^{-3})^4y^{-2}}$

12. $(m^4n^6)^4(m^3n^2p^5)^6$

13. $(3x^2y)(2xy^4) + (4xy^2)(3x^2y^3)$

14. $t^{-5}(t^2 - t^4 + 5t)$

15. $\frac{-20(m^2v)(-v)^3}{5(-v)^2(-m^4)}$

16. $\frac{x^{7y+1}}{x^{7y-5}}$

Evaluate. Express each answer in both scientific and decimal notation.

17. $(4.8 \times 10^2)(6.9 \times 10^4)$

18. $(3.7 \times 10^9)(8.7 \times 10^2)$

19. $\frac{4 \times 10^8}{1.6 \times 10^4}$

20. $\frac{2.7 \times 10^6}{9 \times 10^{10}}$

5-1

NAME _____ DATE _____

Practice

Student Edition
Pages 254–260

Monomials

Simplify. Assume that no variable equals 0.

1. $3n^2v^3 - n^2v^3 + 8v^3n^2$ $10n^2v^3$

2. $4r^6w^2 + 9r^2w^6 - r^6w^2$ $3r^6w^2 + 9r^2w^6$

3. $y^7 \cdot y^3 \cdot y^2$ y^{12}

4. $(n^6)^3$ n^{18}

5. $(2n)^4 + 2n^4$ $18n^4$

6. $\frac{12m^8y^6}{-9my^4}$ $\frac{4m^7y^2}{-3}$

7. $(4a^3c^2)^3(-3ac^4)^2$ $576a^{11}c^{14}$

8. $\left(\frac{3}{2}e^2f^4\right)^4\left(-\frac{4}{3}e^5f\right)^3\left(-\frac{1}{6}ef^5\right)$ $2e^{24}f^{24}$

9. $-5v^2(2r^3v^2)(rv^3) - (-r^2)(16r^2v^7)$
$6r^4v^7$

10. $(-n)^4(2xy^2n)^3 + (4xy^3n^2)^2(-3xn^3)$
$-40x^3y^6n^7$

11. $\frac{(3x^{-2}y^3)(5xy^{-8})}{(x^{-3})^4y^{-2}}$ $\frac{15x^{11}}{y^3}$

12. $(m^4n^6)^4(m^3n^2p^5)^6$ $m^{34}n^{36}p^{30}$

13. $(3x^2y)(2xy^4) + (4xy^2)(3x^2y^3)$
$18x^3y^5$

14. $t^{-5}(t^2 - t^4 + 5t)$ $\frac{1}{t^3} - \frac{1}{t} + \frac{5}{t^4}$

15. $\frac{-20(m^2v)(-v)^3}{5(-v)^2(-m^4)}$ $-\frac{4v^2}{m^2}$

16. $\frac{x^{7y+1}}{x^{7y-5}}$ x^6

Evaluate. Express each answer in both scientific and decimal notation.

17. $(4.8 \times 10^2)(6.9 \times 10^4)$
3.312×10^7; 33,120,000

18. $(3.7 \times 10^9)(8.7 \times 10^2)$
3.219×10^{12}; 3,219,000,000,000

19. $\frac{4 \times 10^8}{1.6 \times 10^4}$
2.5×10^4; 25,000

20. $\frac{2.7 \times 10^6}{9 \times 10^{10}}$
3×10^{-5}; 0.00003

NAME _____ DATE _____

Practice

Student Edition
Pages 261–266

Polynomials

Simplify.

1. $(-6n - 13n^2) + (-3n + 9n^2)$

2. $(8x^2 - 3x) - (4x^2 + 5x - 3)$

3. $(5m^2 - 2mp - 6p^2) - (-3m^2 + 5mp + p^2)$

4. $-9(y - 7w) + 4(2y + w)$

5. $-6a^2w(a^3w - aw^4)$

6. $-9r^4y^2(-3ry^7 + 2r^3y^4 - 8r^{10})$

7. $5a^2w^3(a^2w^6 - 3a^4w^2 + 9aw^6)$

8. $2x^2(x - 1) + (x + 1)^2$

9. $(v^2 - 6)(v^2 + 4)$

10. $(7a + 9y)(2a - y)$

11. $(y - 8)^2$

12. $(x^2 + 5y)^2$

13. $(5x + 4w)(5x - 4w)$

14. $(2n^4 - 3)(2n^4 + 3)$

15. $(x + y)(x^2 - 3xy + 2y^2)$

16. $u(u - 6)(u - 3)$

17. $(n - 3)(n + 4)(n - 1)$

18. $(a - r)^2(2a - 3r)$

19. $(2x + 3y)(4x - 6y + 7z)$

20. $(3a + 4b)^2$

NAME _____ DATE _____

Practice

Student Edition
Pages 261–266

Polynomials

Simplify.

1. $(-6n - 13n^2) + (-3n + 9n^2)$
   $-9n - 4n^2$

2. $(8x^2 - 3x) - (4x^2 + 5x - 3)$
   $4x^2 - 8x + 3$

3. $(5m^2 - 2mp - 6p^2) - (-3m^2 + 5mp + p^2)$
   $8m^2 - 7mp - 7p^2$

4. $-9(y - 7w) + 4(2y + w)$
   $-y + 67w$

5. $-6a^2w(a^3w - aw^4)$
   $-6a^5w^2 + 6a^3w^5$

6. $-9r^4y^2(-3ry^7 + 2r^3y^4 - 8r^{10})$
   $27r^5y^9 - 18r^7y^6 + 72r^{14}y^2$

7. $5a^2w^3(a^2w^6 - 3a^4w^2 + 9aw^6)$
   $5a^4w^9 - 15a^6w^5 + 45a^3w^9$

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

9. $(v^2 - 6)(v^2 + 4)$
   $v^4 - 2v^2 - 24$

10. $(7a + 9y)(2a - y)$
    $14a^2 + 11ay - 9y^2$

11. $(y - 8)^2$
    $y^2 - 16y + 64$

12. $(x^2 + 5y)^2$
    $x^4 + 10x^2y + 25y^2$

13. $(5x + 4w)(5x - 4w)$
    $25x^2 - 16w^2$

14. $(2n^4 - 3)(2n^4 + 3)$
    $4n^8 - 9$

15. $(x + y)(x^2 - 3xy + 2y^2)$
    $x^3 - 2x^2y - xy^2 + 2y^3$

16. $u(u - 6)(u - 3)$
    $u^3 - 9u^2 + 18u$

17. $(n - 3)(n + 4)(n - 1)$
    $n^3 - 13n + 12$

18. $(a - r)^2(2a - 3r)$
    $2a^3 - 7a^2r + 8ar^2 - 3r^3$

19. $(2x + 3y)(4x - 6y + 7z)$
    $8x^2 + 14xz - 18y^2 + 21yz$

20. $(3a + 4b)^2$
    $9a^2 + 24ab + 16b^2$

NAME _____ DATE _____

Practice

Student Edition
Pages 267–273

Dividing Polynomials

Simplify.

1. $(-30x^3y + 12x^2y^2 - 18x^2y) \div (-6x^2y)$

2. $(2x^2 + 3x - 4) \div (x - 2)$

3. $(4x^2 - 2x + 6)(2x - 3)^{-1}$

4. $(x^4 - 3x^3 + 5x - 6) \div (x + 2)$

5. $(6x^2 - x - 7) \div (3x + 1)$

6. $(2x^3 + 4x - 6) \div (x + 3)$

Use synthetic division to find each quotient.

7. $(2r^3 + 5r^2 - 2r - 15) \div (2r - 3)$

8. $(x^4 - 20) \div (x + 2)$

NAME _____ DATE _____

Practice

Student Edition
Pages 267–273

Dividing Polynomials

Simplify.

1. $(-30x^3y + 12x^2y^2 - 18x^2y) \div (-6x^2y)$

$5x - 2y + 3$

2. $(2x^2 + 3x - 4) \div (x - 2)$

$2x + 7 + \frac{10}{x - 2}$

3. $(4x^2 - 2x + 6)(2x - 3)^{-1}$

$2x + 2 + \frac{12}{2x - 3}$

4. $(x^4 - 3x^3 + 5x - 6) \div (x + 2)$

$x^3 - 5x^2 + 10x - 15 + \frac{24}{x + 2}$

5. $(6x^2 - x - 7) \div (3x + 1)$

$2x - 1 - \frac{6}{3x + 1}$

6. $(2x^3 + 4x - 6) \div (x + 3)$

$2x^2 - 6x + 22 - \frac{72}{x + 3}$

Use synthetic division to find each quotient.

7. $(2r^3 + 5r^2 - 2r - 15) \div (2r - 3)$

$r^2 + 4r + 5$

8. $(x^4 - 20) \div (x + 2)$

$x^3 - 2x^2 + 4x - 8 - \frac{4}{x + 2}$

NAME _____ DATE _____

Practice

Student Edition
Pages 274–280

Factoring

Factor completely.

1. $15a^2b - 10ab^2$

2. $2x^3y - x^2y + 5xy^2 + xy^3$

3. $16r^2 - 169$

4. $c^2 - 49$

5. $2y^2 - 242$

6. $x^3 + 8$

7. $8m^3 - 1$

8. $b^4 - 81$

9. $x^2 - 3x - 10$

10. $r^3 + 3r^2 - 54r$

11. $4a^2 + a - 3$

12. $2t^3 + 32t^2 + 128t$

13. $y^2 + 20y + 96$

14. $6n^2 - 11n - 2$

15. $x^2 - 8x + 16$

16. $21 - 7t + 3r - rt$

17. $x^2 + 2x - xy - 2y$

18. $x^2 + 2xy + 2x + y^2 + 2y - 8$

19. $4x^6 - 4x^2$

20. $k^3 - 2k^2r - 3kr^2$

21. $45x^2 - 80y^2$

22. $36a^3b^2 + 66a^2b^3 - 210ab^4$

23. $4a^2 + 12ab + 9b^2 - 25c^2$

24. $81x^4 - 16$

25. $5y^5 + 135y^2$

26. $18p^3 - 51p^2 - 135p$

NAME _____ DATE _____

Practice

Student Edition
Pages 274–280

Factoring

Factor completely.

1. $15a^2b - 10ab^2$
   $5ab(3a - 2b)$

2. $2x^3y - x^2y + 5xy^2 + xy^3$
   $xy(2x^2 - x + 5y + y^2)$

3. $16r^2 - 169$
   $(4r + 13)(4r - 13)$

4. $c^2 - 49$
   $(c + 7)(c - 7)$

5. $2y^2 - 242$
   $2(y + 11)(y - 11)$

6. $x^3 + 8$
   $(x + 2)(x^2 - 2x + 4)$

7. $8m^3 - 1$
   $(2m - 1)(4m^2 + 2m + 1)$

8. $b^4 - 81$
   $(b^2 + 9)(b + 3)(b - 3)$

9. $x^2 - 3x - 10$
   $(x - 5)(x + 2)$

10. $r^3 + 3r^2 - 54r$
    $r(r + 9)(r - 6)$

11. $4a^2 + a - 3$
    $(4a - 3)(a + 1)$

12. $2t^3 + 32t^2 + 128t$
    $2t(t + 8)^2$

13. $y^2 + 20y + 96$
    $(y + 8)(y + 12)$

14. $6n^2 - 11n - 2$
    $(6n + 1)(n - 2)$

15. $x^2 - 8x + 16$
    $(x - 4)^2$

16. $21 - 7t + 3r - rt$
    $(r + 7)(3 - t)$

17. $x^2 + 2x - xy - 2y$
    $(x + 2)(x - y)$

18. $x^2 + 2xy + 2x + y^2 + 2y - 8$
    $(x + y + 4)(x + y - 2)$

19. $4x^6 - 4x^2$
    $4x^2(x^2 + 1)(x + 1)(x - 1)$

20. $k^3 - 2k^2r - 3kr^2$
    $k(k - 3r)(k + r)$

21. $45x^2 - 80y^2$
    $5(3x + 4y)(3x - 4y)$

22. $36a^3b^2 + 66a^2b^3 - 210ab^4$
    $6ab^2(3a - 5b)(2a + 7b)$

23. $4a^2 + 12ab + 9b^2 - 25c^2$
    $(2a + 3b + 5c)(2a + 3b - 5c)$

24. $81x^4 - 16$
    $(9x^2 + 4)(3x + 2)(3x - 2)$

25. $5y^5 + 135y^2$
    $5y^2(y + 3)(y^2 - 3y + 9)$

26. $18p^3 - 51p^2 - 135p$
    $3p(2p - 9)(3p + 5)$

NAME _____ DATE _____

Practice

Roots of Real Numbers

Simplify.

1. $\sqrt[5]{32}$
2. $-\sqrt[4]{256}$
3. $\sqrt{x^2 + 10x + 25}$
4. $\sqrt[6]{(m + 4)^6}$
5. $\sqrt[3]{-64r^6w^{15}}$
6. $\sqrt{49m^2t^8}$
7. $\sqrt[4]{81}$
8. $\sqrt[3]{-64}$
9. $\sqrt{(2x)^8}$
10. $-\sqrt[4]{625}$
11. $\sqrt[3]{216}$
12. $\sqrt{676x^4y^6}$
13. $\sqrt[3]{(2x + 1)^3}$
14. $\sqrt[5]{-32x^5y^{10}}$
15. $-\sqrt{144m^8n^6}$
16. $\sqrt[3]{-27x^9y^{12}}$
17. $\sqrt[5]{243x^{10}}$
18. $-\sqrt{49a^{10}b^{16}}$
19. $\sqrt[4]{(x - 5)^8}$
20. $\sqrt[3]{343d^6}$
21. $\sqrt{0.81}$
22. $-\sqrt{0.0016}$
23. $\sqrt[3]{0.512}$
24. $-\sqrt[4]{0.6561}$

Use a calculator to approximate each value to three decimal places.

25. $\sqrt{7.8}$
26. $-\sqrt{89}$
27. $\sqrt[3]{25}$
28. $\sqrt[3]{-4}$

NAME _____ DATE _____

Practice

Student Edition
Pages 281–287

Roots of Real Numbers

Simplify.

1. $\sqrt[5]{32}$ **2**

2. $-\sqrt[4]{256}$ **-4**

3. $\sqrt{x^2 + 10x + 25}$ **$|x + 5|$**

4. $\sqrt[6]{(m + 4)^6}$ **$|m + 4|$**

5. $\sqrt[3]{-64r^6w^{15}}$ **$-4r^2w^5$**

6. $\sqrt{49m^2t^8}$ **$7|m|t^4$**

7. $\sqrt[4]{81}$ **3**

8. $\sqrt[3]{-64}$ **-4**

9. $\sqrt{(2x)^8}$ **$16x^4$**

10. $-\sqrt[4]{625}$ **-5**

11. $\sqrt[3]{216}$ **6**

12. $\sqrt{676x^4y^6}$ **$26x^2|y^3|$**

13. $\sqrt[3]{(2x + 1)^3}$ **$2x + 1$**

14. $\sqrt[5]{-32x^5y^{10}}$ **$-2xy^2$**

15. $-\sqrt{144m^8n^6}$ **$-12m^4|n^3|$**

16. $\sqrt[3]{-27x^9y^{12}}$ **$-3x^3y^4$**

17. $\sqrt[5]{243x^{10}}$ **$3x^2$**

18. $-\sqrt{49a^{10}b^{16}}$ **$-7|a^5|b^8$**

19. $\sqrt[4]{(x - 5)^8}$ **$(x - 5)^2$**

20. $\sqrt[3]{343d^6}$ **$7d^2$**

21. $\sqrt{0.81}$ **0.9**

22. $-\sqrt{0.0016}$ **-0.04**

23. $\sqrt[3]{0.512}$ **0.8**

24. $-\sqrt[4]{0.6561}$ **-0.9**

Use a calculator to approximate each value to three decimal places.

25. $\sqrt{7.8}$ **2.793**

26. $-\sqrt{89}$ **-9.434**

27. $\sqrt[3]{25}$ **2.924**

28. $\sqrt[3]{-4}$ **-1.587**

NAME _____ DATE _____

Practice

Student Edition
Pages 288–295

Radical Expressions

Simplify.

1. $\sqrt[3]{-432}$

2. $\sqrt{540}$

3. $\sqrt{5}(\sqrt{10} - \sqrt{45})$

4. $\sqrt[3]{6}(4\sqrt[3]{12} + 5\sqrt[3]{9})$

5. $(2\sqrt[3]{24})(7\sqrt[3]{18})$

6. $\sqrt[4]{\frac{8}{9a^3}}$

7. $\sqrt{\frac{11}{9}}$

8. $\sqrt[3]{-6750}$

9. $\sqrt{3x^2y^3} \cdot \sqrt{75xy^5}$

10. $\sqrt[3]{9t^5v^8} \cdot \sqrt[3]{6tv^4}$

11. $\sqrt{60} \cdot \sqrt{105}$

12. $\sqrt[3]{3600} \cdot \sqrt[3]{165}$

13. $\sqrt{810} + \sqrt{240} + \sqrt{135} - \sqrt{250}$

14. $\sqrt[3]{216} - \sqrt[3]{48} + \sqrt[3]{432}$

15. $(\sqrt{12} - 2\sqrt{3})^2$

16. $(\sqrt{18} + 2\sqrt{3})^2$

17. $(\sqrt{5} - \sqrt{6})(\sqrt{5} + \sqrt{2})$

18. $(\sqrt{50} + \sqrt{27})(\sqrt{2} - \sqrt{6})$

19. $\frac{3}{2 - \sqrt{5}}$

20. $\frac{6}{\sqrt{2} - 1}$

21. $\frac{5 + \sqrt{3}}{4 + \sqrt{3}}$

22. $\frac{6}{2 - \sqrt{7}}$

23. $\sqrt[3]{144} + \sqrt[3]{\frac{2}{3}} - 5\sqrt[3]{18}$

24. $\sqrt{\frac{3}{8}} + \sqrt{54} - \sqrt{6}$

NAME _____ DATE _____

Practice

Student Edition
Pages 288–295

Radical Expressions

Simplify.

1. $\sqrt[3]{-432}$ $-6\sqrt[3]{2}$

2. $\sqrt{540}$ $6\sqrt{15}$

3. $\sqrt{5}(\sqrt{10} - \sqrt{45})$ $5\sqrt{2} - 15$

4. $\sqrt[3]{6}(4\sqrt[3]{12} + 5\sqrt[3]{9})$ $8\sqrt[3]{9} + 15\sqrt[3]{2}$

5. $(2\sqrt[3]{24})(7\sqrt[3]{18})$ $84\sqrt[3]{2}$

6. $\sqrt[4]{\frac{8}{9a^3}}$ $\frac{\sqrt[4]{72a}}{3a}$

7. $\sqrt{\frac{11}{9}}$ $\frac{\sqrt{11}}{3}$

8. $\sqrt[3]{-6750}$ $-15\sqrt[3]{2}$

9. $\sqrt{3x^2y^3} \cdot \sqrt{75xy^5}$ $15|x|y^4\sqrt{x}$

10. $\sqrt[3]{9t^5v^8} \cdot \sqrt[3]{6tv^4}$ $3t^2v^4\sqrt[3]{2}$

11. $\sqrt{60} \cdot \sqrt{105}$ $30\sqrt{7}$

12. $\sqrt[3]{3600} \cdot \sqrt[3]{165}$ $30\sqrt[3]{22}$

13. $\sqrt{810} + \sqrt{240} + \sqrt{135} - \sqrt{250}$
$4\sqrt{10} + 7\sqrt{15}$

14. $\sqrt[3]{216} - \sqrt[3]{48} + \sqrt[3]{432}$
$6 - 2\sqrt[3]{6} + 6\sqrt[3]{2}$

15. $(\sqrt{12} - 2\sqrt{3})^2$ 0

16. $(\sqrt{18} + 2\sqrt{3})^2$ $30 + 12\sqrt{6}$

17. $(\sqrt{5} - \sqrt{6})(\sqrt{5} + \sqrt{2})$
$5 + \sqrt{10} - \sqrt{30} - 2\sqrt{3}$

18. $(\sqrt{50} + \sqrt{27})(\sqrt{2} - \sqrt{6})$
$10 - 10\sqrt{3} + 3\sqrt{6} - 9\sqrt{2}$

19. $\frac{3}{2 - \sqrt{5}}$ $-6 - 3\sqrt{5}$

20. $\frac{6}{\sqrt{2} - 1}$ $6\sqrt{2} + 6$

21. $\frac{5 + \sqrt{3}}{4 + \sqrt{3}}$ $\frac{17 - \sqrt{3}}{13}$

22. $\frac{6}{2 - \sqrt{7}}$ $-4 - 2\sqrt{7}$

23. $\sqrt[3]{144} + \sqrt[3]{\frac{2}{3}} - 5\sqrt[3]{18}$ $-\frac{8}{3}\sqrt[3]{18}$

24. $\sqrt{\frac{3}{8}} + \sqrt{54} - \sqrt{6}$ $\frac{9}{4}\sqrt{6}$

NAME _____ DATE _____

Practice

Student Edition
Pages 296–302

Rational Exponents

Express using rational exponents.

1. $\sqrt[3]{26}$

2. $\sqrt[5]{8}$

3. $\sqrt[10]{x^6}$

4. $\sqrt[3]{28x^2y^3t^{11}}$

5. $4\sqrt{2a^{10}b^3}$

6. $\sqrt[3]{27m^6n^4}$

Simplify.

7. $x^{\frac{3}{5}}$

8. $27^{\frac{1}{6}}$

9. $a^{\frac{2}{3}}g^{\frac{1}{4}}e^{\frac{1}{2}}$

10. $w^{\frac{3}{7}}n^{\frac{5}{3}}$

11. $m^{\frac{1}{3}}v^{\frac{3}{4}}z^{\frac{5}{6}}$

12. $27^{\frac{1}{2}}b^{\frac{2}{3}}c^{\frac{7}{6}}$

13. $y^{-\frac{1}{2}}$

14. $b^{-\frac{3}{5}}$

15. $\dfrac{1}{w^{\frac{4}{5}}}$

16. $\dfrac{1}{b^{\frac{4}{7}}}$

17. $\dfrac{14}{7^{\frac{2}{3}}}$

18. $\dfrac{12}{3^{\frac{5}{2}}}$

19. $x^{-\frac{3}{5}}$

20. $\dfrac{r^2t^3}{\sqrt[4]{a^3}}$

21. $(w^{-\frac{3}{8}})^{-\frac{4}{9}}$

22. $(\sqrt[8]{11}x^{\frac{3}{4}}y^{-\frac{1}{2}})^4$

23. $\dfrac{r^{-\frac{3}{4}}y^{-\frac{3}{2}}}{\sqrt{y}r^{-\frac{1}{2}}}$

24. $\left(\dfrac{n^{-\frac{4}{5}}}{x^{-10}n^{\frac{2}{5}}}\right)^{-5}$

NAME _____ DATE _____

Practice

Student Edition
Pages 296–302

Rational Exponents

Express using rational exponents.

1. $\sqrt[3]{26}$ $26^{\frac{1}{3}}$

2. $\sqrt[5]{8}$ $8^{\frac{1}{5}}$ or $2^{\frac{3}{5}}$

3. $\sqrt[10]{x^6}$ $x^{\frac{3}{5}}$

4. $\sqrt[3]{28x^2y^3t^{11}}$ $28^{\frac{1}{3}}x^{\frac{2}{3}}yt^{\frac{11}{3}}$

5. $4\sqrt{2a^{10}b^3}$ $2^{\frac{5}{2}}a^5b^{\frac{3}{2}}$ or $4 \cdot 2^{\frac{1}{2}}a^5b^{\frac{3}{2}}$

6. $\sqrt[3]{27m^6n^4}$ $3m^2n^{\frac{4}{3}}$

Simplify.

7. $x^{\frac{3}{5}}$ $\sqrt[5]{x^3}$

8. $27^{\frac{1}{6}}$ $\sqrt{3}$

9. $a^{\frac{2}{3}}g^{\frac{1}{4}}e^{\frac{1}{2}}$ $\sqrt[12]{a^8g^3e^6}$

10. $w^{\frac{3}{7}}n^{\frac{5}{3}}$ $n\sqrt[21]{w^9n^{14}}$

11. $m^{\frac{1}{3}}v^{\frac{3}{4}}z^{\frac{5}{6}}$ $\sqrt[12]{m^4v^9z^{10}}$

12. $27^{\frac{1}{2}}b^{\frac{2}{3}}c^{\frac{7}{6}}$ $3c\sqrt[6]{27b^4c}$

13. $y^{-\frac{1}{2}}$ $\frac{y^{\frac{1}{2}}}{y}$

14. $b^{-\frac{3}{5}}$ $\frac{b^{\frac{2}{5}}}{b}$

15. $\frac{1}{w^{\frac{4}{5}}}$ $\frac{w^{\frac{1}{5}}}{w}$

16. $\frac{1}{b^{\frac{4}{7}}}$ $\frac{b^{\frac{3}{7}}}{b}$

17. $\frac{14}{7^{\frac{2}{3}}}$ $2 \cdot 7^{\frac{1}{3}}$

18. $\frac{12}{3^{\frac{5}{2}}}$ $\frac{4 \cdot 3^{\frac{1}{2}}}{9}$

19. $x^{-\frac{3}{5}}$ $\frac{x^{\frac{2}{5}}}{x}$

20. $\frac{r^2t^3}{\sqrt[4]{a^3}}$ $\frac{r^2t^3a^{\frac{1}{4}}}{a}$

21. $(w^{-\frac{3}{8}})^{-\frac{4}{9}}$ $w^{\frac{1}{6}}$

22. $(\sqrt[8]{11}x^{\frac{3}{4}}y^{-\frac{1}{2}})^4$ $\frac{\sqrt{11}x^3}{y^2}$

23. $\frac{r^{-\frac{3}{4}}y^{-\frac{3}{2}}}{\sqrt{y}r^{-\frac{1}{2}}}$ $\frac{r^{\frac{3}{4}}}{y^2r}$

24. $\left(\frac{n^{-\frac{4}{5}}}{x^{-10}n^{\frac{2}{5}}}\right)^{-5}$ $\frac{n^6}{x^{50}}$

NAME _____ DATE _____

Practice

Student Edition
Pages 303–309

Solving Equations Containing Radicals

Solve each equation. Be sure to check for extraneous solutions.

1. $7x\sqrt{3} - 5 = 0$

2. $4x - x\sqrt{3} = 6$

3. $18 - 3x = x\sqrt{2}$

4. $\sqrt{x + 8} - 5 = 0$

5. $\sqrt[3]{y - 7} = 4$

6. $\sqrt[4]{3x} - 2 = 0$

7. $\sqrt{8n - 5} - 1 = 2$

8. $\sqrt{1 - 4t} - 8 = -6$

9. $\sqrt[4]{7v - 2} + 12 = 7$

10. $\sqrt[3]{6u - 5} + 2 = -3$

11. $\sqrt{6x - 4} = \sqrt{2x + 10}$

12. $\sqrt{9u - 4} = \sqrt{7u - 20}$

13. $\sqrt{k + 9} - \sqrt{k} = \sqrt{3}$

14. $\sqrt{x + 10} + \sqrt{x - 6} = 8$

15. $\sqrt{x + 2} - 7 = \sqrt{x + 9}$

16. $\sqrt{4x^2 - 3x + 2} - 2x - 5 = 0$

NAME _____ DATE _____

Practice

Student Edition
Pages 303–309

Solving Equations Containing Radicals

Solve each equation. Be sure to check for extraneous solutions.

1. $7x\sqrt{3} - 5 = 0$
$\frac{5\sqrt{3}}{21}$

2. $4x - x\sqrt{3} = 6$
$\frac{24 + 6\sqrt{3}}{13}$

3. $18 - 3x = x\sqrt{2}$
$\frac{54 - 18\sqrt{2}}{7}$

4. $\sqrt{x + 8} - 5 = 0$
17

5. $\sqrt[3]{y - 7} = 4$
71

6. $\sqrt[4]{3x} - 2 = 0$
$\frac{16}{3}$

7. $\sqrt{8n - 5} - 1 = 2$
$\frac{7}{4}$

8. $\sqrt{1 - 4t} - 8 = -6$
$-\frac{3}{4}$

9. $\sqrt[4]{7v - 2} + 12 = 7$
no real solution

10. $\sqrt[3]{6u - 5} + 2 = -3$
−20

11. $\sqrt{6x - 4} = \sqrt{2x + 10}$
$\frac{7}{2}$

12. $\sqrt{9u - 4} = \sqrt{7u - 20}$
no real solution

13. $\sqrt{k + 9} - \sqrt{k} = \sqrt{3}$
3

14. $\sqrt{x + 10} + \sqrt{x - 6} = 8$
15

15. $\sqrt{x + 2} - 7 = \sqrt{x + 9}$
no real solution

16. $\sqrt{4x^2 - 3x + 2} - 2x - 5 = 0$
−1

NAME _____ DATE _____

Practice

Complex Numbers

Simplify.

1. $\sqrt{-49}$

2. $\sqrt{-48}$

3. $6\sqrt{-12}$

4. $\sqrt{\frac{-16}{25}}$

5. $\sqrt{\frac{-2}{7}}$

6. $\sqrt{\frac{-8}{3}}$

7. $\boldsymbol{i}^{42}$

8. $\boldsymbol{i}^{91}$

9. $(7 - 6\boldsymbol{i}) + (9 + 11\boldsymbol{i})$

10. $(5 + \sqrt{-8}) + (-13 + 4\sqrt{-2})$

11. $-6(2 - 8\boldsymbol{i}) + 3(5 + 7\boldsymbol{i})$

12. $4(7 - \boldsymbol{i}) - 5(2 - 6\boldsymbol{i})$

13. $(3 - 4\boldsymbol{i})^2$

14. $(\sqrt{5} + 2\boldsymbol{i})^2$

15. $(6 - 4\boldsymbol{i})(6 + 4\boldsymbol{i})$

16. $(8 - \sqrt{-11})(8 + \sqrt{-11})$

17. $5(2 + 3\boldsymbol{i}) + 6(8 - 5\boldsymbol{i})$

18. $(4 + 3\boldsymbol{i})(2 - 5\boldsymbol{i})(4 - 3\boldsymbol{i})$

Solve each equation.

19. $n^2 + 25 = 0$

20. $m^2 + 10 = 0$

21. $6y^2 + 42 = 0$

22. $4r^2 + 64 = 0$

Find the values of x and y for which each equation is true.

23. $3x - 5y\boldsymbol{i} = 15 - 20\boldsymbol{i}$

24. $\sqrt{3}x + 7y\boldsymbol{i} = 6 - 2\boldsymbol{i}$

NAME _____ DATE _____

Practice

Student Edition
Pages 310–316

Complex Numbers

Simplify.

1. $\sqrt{-49}$ **7i**

2. $\sqrt{-48}$ **$4i\sqrt{3}$**

3. $6\sqrt{-12}$ **$12i\sqrt{3}$**

4. $\sqrt{\frac{-16}{25}}$ **$\frac{4}{5}i$**

5. $\sqrt{\frac{-2}{7}}$ **$\frac{i\sqrt{14}}{7}$**

6. $\sqrt{\frac{-8}{3}}$ **$\frac{2i\sqrt{6}}{3}$**

7. i^{42} **-1**

8. i^{91} **$-i$**

9. $(7 - 6i) + (9 + 11i)$
$16 + 5i$

10. $(5 + \sqrt{-8}) + (-13 + 4\sqrt{-2})$
$-8 + 6i\sqrt{2}$

11. $-6(2 - 8i) + 3(5 + 7i)$
$3 + 69i$

12. $4(7 - i) - 5(2 - 6i)$
$18 + 26i$

13. $(3 - 4i)^2$
$-7 - 24i$

14. $(\sqrt{5} + 2i)^2$
$1 + 4i\sqrt{5}$

15. $(6 - 4i)(6 + 4i)$
52

16. $(8 - \sqrt{-11})(8 + \sqrt{-11})$
75

17. $5(2 + 3i) + 6(8 - 5i)$
$58 - 15i$

18. $(4 + 3i)(2 - 5i)(4 - 3i)$
$50 - 125i$

Solve each equation.

19. $n^2 + 25 = 0$ **$\pm 5i$**

20. $m^2 + 10 = 0$ **$\pm i\sqrt{10}$**

21. $6y^2 + 42 = 0$ **$\pm i\sqrt{7}$**

22. $4r^2 + 64 = 0$ **$\pm 4i$**

Find the values of x and y for which each equation is true.

23. $3x - 5yi = 15 - 20i$
$x = 5$
$y = 4$

24. $\sqrt{3}x + 7yi = 6 - 2i$
$x = 2\sqrt{3}$
$y = -\frac{2}{7}$

NAME _____ DATE _____

Practice

Simplifying Expressions Containing Complex Numbers

Simplify.

1. $\frac{2 - 4i}{1 + 3i}$

2. $\frac{3 - i}{2 - i}$

3. $\frac{6 + 5i}{-2i}$

4. $\frac{1 + 6i}{5i}$

5. $\frac{3 - 6i}{-4i}$

6. $\frac{2 + 7i}{-5i}$

7. $\frac{3}{6 + 4i}$

8. $\frac{2}{7 - 8i}$

9. $\frac{3}{\sqrt{2} - 5i}$

10. $\frac{2 + i\sqrt{3}}{1 + i\sqrt{3}}$

11. $\frac{(1 - 2i)^2}{(2 - i)^2}$

12. $\frac{2 + i}{(1 - i)^2}$

13. $\frac{3}{\sqrt{5} + 2i}$

14. $\frac{2 - i}{\sqrt{2} + 2i}$

15. $\frac{(1 + 3i)^2}{(4 - i)^2}$

16. $\frac{2 - i\sqrt{3}}{1 + i\sqrt{3}}$

Find the multiplicative inverse of each complex number.

17. $5 + 2i$

18. $3 - i$

19. $\frac{i}{7 + 4i}$

20. $\frac{-6i}{4 - 5i}$

NAME _____ DATE _____

Practice

Student Edition
Pages 317–321

Simplifying Expressions Containing Complex Numbers

Simplify.

1. $\frac{2 - 4i}{1 + 3i}$ **−1 − i**

2. $\frac{3 - i}{2 - i}$ **$\frac{7 + i}{5}$**

3. $\frac{6 + 5i}{-2i}$ **$\frac{-5 + 6i}{2}$**

4. $\frac{1 + 6i}{5i}$ **$\frac{6 - i}{5}$**

5. $\frac{3 - 6i}{-4i}$ **$\frac{6 + 3i}{4}$**

6. $\frac{2 + 7i}{-5i}$ **$\frac{-7 + 2i}{5}$**

7. $\frac{3}{6 + 4i}$ **$\frac{9 - 6i}{26}$**

8. $\frac{2}{7 - 8i}$ **$\frac{14 + 16i}{113}$**

9. $\frac{3}{\sqrt{2} - 5i}$ **$\frac{\sqrt{2} + 5i}{9}$**

10. $\frac{2 + i\sqrt{3}}{1 + i\sqrt{3}}$ **$\frac{5 - i\sqrt{3}}{4}$**

11. $\frac{(1 - 2i)^2}{(2 - i)^2}$ **$\frac{7 - 24i}{25}$**

12. $\frac{2 + i}{(1 - i)^2}$ **$\frac{-1 + 2i}{2}$**

13. $\frac{3}{\sqrt{5} + 2i}$ **$\frac{\sqrt{5} - 2i}{3}$**

14. $\frac{2 - i}{\sqrt{2} + 2i}$ **$\frac{-2 + 2\sqrt{2} - (4 + \sqrt{2})i}{6}$**

15. $\frac{(1 + 3i)^2}{(4 - i)^2}$ **$\frac{-168 + 26i}{289}$**

16. $\frac{2 - i\sqrt{3}}{1 + i\sqrt{3}}$ **$\frac{-1 - 3i\sqrt{3}}{4}$**

Find the multiplicative inverse of each complex number.

17. $5 + 2i$ **$\frac{5 - 2i}{29}$**

18. $3 - i$ **$\frac{3 + i}{10}$**

19. $\frac{i}{7 + 4i}$ **4 − 7i**

20. $\frac{-6i}{4 - 5i}$ **$\frac{5 + 4i}{6}$**

NAME _____ DATE _____

Practice

Solving Quadratic Equations by Factoring

Solve each equation by factoring.

1. $x^2 - 4x - 12 = 0$

2. $y^2 - 16y + 64 = 0$

3. $n^2 + 25 = 10n$

4. $9z = 10z^2$

5. $7y^2 = 4y$

6. $c^2 = 2c + 99$

7. $5w^2 - 35w + 60 = 0$

8. $3d^2 + 24d + 45 = 0$

9. $15v^2 + 19v + 6 = 0$

10. $4j^2 + 6 = 11j$

11. $36k^2 = 25$

12. $12m^3 - 8m^2 = 15m$

13. $6e^3 = 5e^2 + 6e$

14. $9 = 64p^2$

Solve. Use any strategy.

15. At a cattle pen at the county fair, Jody counted 65 heads and 236 legs. How many cattle and how many workers were there in the pen at that time?

16. Replace each letter with a whole number so that the addition problem at the right is correct. Each letter represents a different number. (There are four possible answers.)

$$\begin{array}{r} A\ B\ C\ D \\ +\ D\ C\ B\ A \\ \hline 5\ 5\ 5\ 5 \end{array}$$

NAME _____ DATE _____

Practice

Student Edition
Pages 341–345

Solving Quadratic Equations by Factoring

Solve each equation by factoring.

1. $x^2 - 4x - 12 = 0$ **6, −2**

2. $y^2 - 16y + 64 = 0$ **8**

3. $n^2 + 25 = 10n$ **5**

4. $9z = 10z^2$ **0, $\frac{9}{10}$**

5. $7y^2 = 4y$ **0, $\frac{4}{7}$**

6. $c^2 = 2c + 99$ **−9, 11**

7. $5w^2 - 35w + 60 = 0$ **3, 4**

8. $3d^2 + 24d + 45 = 0$ **−5, −3**

9. $15v^2 + 19v + 6 = 0$ **$-\frac{3}{5}$, $-\frac{2}{3}$**

10. $4j^2 + 6 = 11j$ **$\frac{3}{4}$, 2**

11. $36k^2 = 25$ **$\frac{5}{6}$, $-\frac{5}{6}$**

12. $12m^3 - 8m^2 = 15m$ **0, $-\frac{5}{6}$, $\frac{3}{2}$**

13. $6e^3 = 5e^2 + 6e$ **0, $\frac{3}{2}$, $-\frac{2}{3}$**

14. $9 = 64p^2$ **$\frac{3}{8}$, $-\frac{3}{8}$**

Solve. Use any strategy.

15. At a cattle pen at the county fair, Jody counted 65 heads and 236 legs. How many cattle and how many workers were there in the pen at that time?
53 cattle, 12 workers

16. Replace each letter with a whole number so that the addition problem at the right is correct. Each letter represents a different number. (There are four possible answers.)

	A	B	C	D
+	D	C	B	A
	5	5	5	5

A = 1, B = 2, C = 3, D = 4;
A = 1, B = 3, C = 2, D = 4;
A = 2, B = 4, C = 1, D = 3;
A = 2, B = 1, C = 4, D = 3

NAME _____ DATE _____

Practice

Student Edition
Pages 346–352

Completing the Square

Find the value of c that makes each trinomial a perfect square.

1. $a^2 + 12a + c$

2. $h^2 - 20h + c$

3. $p^2 - p + c$

4. $m^2 + 11m + c$

5. $t^2 + \frac{5}{6}t + c$

6. $u^2 - \frac{u}{4} + c$

7. $b^2 - \frac{5}{3}b + c$

8. $x^2 + 17x + c$

Find the exact solution for each equation by completing the square.

9. $x^2 - 14x + 19 = 0$

10. $n^2 + 16n - 7 = 0$

11. $d^2 + d - 5 = 0$

12. $v^2 + 18 = 9v$

13. $3x^2 - 5x + 2 = 0$

14. $2x^2 + 8x - 3 = 0$

15. $2b^2 - 5b - 6 = 0$

16. $p^2 + 8p + 10 = 0$

17. $q^2 - 9q + 11 = 0$

18. $3a^2 + a - 2 = 0$

19. $c^2 + 6c + 8 = 0$

20. $2d^2 - 10d + 5 = 0$

NAME _____ DATE _____

Practice

Student Edition
Pages 346–352

Completing the Square

Find the value of c that makes each trinomial a perfect square.

1. $a^2 + 12a + c$ **36**

2. $h^2 - 20h + c$ **100**

3. $p^2 - p + c$ $\frac{1}{4}$

4. $m^2 + 11m + c$ $\frac{121}{4}$

5. $t^2 + \frac{5}{6}t + c$ $\frac{25}{144}$

6. $u^2 - \frac{u}{4} + c$ $\frac{1}{64}$

7. $b^2 - \frac{5}{3}b + c$ $\frac{25}{36}$

8. $x^2 + 17x + c$ $\frac{289}{4}$

Find the exact solution for each equation by completing the square.

9. $x^2 - 14x + 19 = 0$ $7 \pm \sqrt{30}$

10. $n^2 + 16n - 7 = 0$ $-8 \pm \sqrt{71}$

11. $d^2 + d - 5 = 0$ $\frac{-1 \pm \sqrt{21}}{2}$

12. $v^2 + 18 = 9v$ **6, 3**

13. $3x^2 - 5x + 2 = 0$ $1, \frac{2}{3}$

14. $2x^2 + 8x - 3 = 0$ $\frac{-4 \pm \sqrt{22}}{2}$

15. $2b^2 - 5b - 6 = 0$ $\frac{5 \pm \sqrt{73}}{4}$

16. $p^2 + 8p + 10 = 0$ $-4 \pm \sqrt{6}$

17. $q^2 - 9q + 11 = 0$ $\frac{9 \pm \sqrt{37}}{2}$

18. $3a^2 + a - 2 = 0$ $\frac{2}{3}, -1$

19. $c^2 + 6c + 8 = 0$ **−4, −2**

20. $2d^2 - 10d + 5 = 0$ $\frac{5 \pm \sqrt{15}}{2}$

NAME _____ DATE _____

Practice

Student Edition
Pages 353–357

The Quadratic Formula and the Discriminant

Find the value of the discriminant and describe the nature of the roots of each quadratic equation. Then solve the equation. Express irrational roots as exact and approximate to the nearest hundredth.

1. $x^2 - 9x + 14 = 0$

2. $r^2 = 3r$

3. $9u^2 - 24u + 16 = 0$

4. $n^2 - 3n = 40$

5. $3t^2 + 9t - 2 = 0$

6. $7u^2 + 6u + 2 = 0$

7. $5w^2 - 2w + 4 = 0$

8. $12x^2 - x - 6 = 0$

9. $2m^2 + 7m = 0$

10. $x^2 - \frac{1}{2}x + \frac{1}{16} = 0$

11. $12x^2 + 2x - 4 = 0$

12. $6w^2 - 2w - 1 = 0$

NAME _____ DATE _____

Practice

Student Edition
Pages 353–357

The Quadratic Formula and the Discriminant

Find the value of the discriminant and describe the nature of the roots of each quadratic equation. Then solve the equation. Express irrational roots as exact and approximate to the nearest hundredth.

1. $x^2 - 9x + 14 = 0$
25; 2 real, rational; 7, 2

2. $r^2 = 3r$
9; 2 real, rational; 0, 3

3. $9u^2 - 24u + 16 = 0$
0; 1 real, rational; $\frac{4}{3}$

4. $n^2 - 3n = 40$
169; 2 real, rational; −5, 8

5. $3t^2 + 9t - 2 = 0$
105; 2 real, irrational; $\frac{-9 \pm \sqrt{105}}{6}$;

6. $7u^2 + 6u + 2 = 0$
−20; 2 imaginary; $\frac{-3 \pm \sqrt{5}i}{7}$
0.21, −3.2

7. $5w^2 - 2w + 4 = 0$
−76; 2 imaginary; $\frac{1 \pm \sqrt{19}i}{5}$

8. $12x^2 - x - 6 = 0$
289; 2 real, rational; $\frac{3}{4}$, $-\frac{2}{3}$

9. $2m^2 + 7m = 0$
49; 2 real, rational; 0, $-\frac{7}{2}$

10. $x^2 - \frac{1}{2}x + \frac{1}{16} = 0$
0; 1 real, rational; $\frac{1}{4}$

11. $12x^2 + 2x - 4 = 0$
196; 2 real, rational; $\frac{1}{2}$, $-\frac{2}{3}$

12. $6w^2 - 2w - 1 = 0$
28; 2 real, irrational; $\frac{1 \pm \sqrt{7}}{6}$;
0.61, −0.27

NAME _____ DATE _____

Practice

Student Edition
Pages 523–528

Composition of Functions

Find [f ∘ g](2) and [g ∘ f](2).

1. $f(x) = 2x - 1$
$g(x) = -3x$

2. $f(x) = x^2 - 5$
$g(x) = 3x^2 + 1$

Find f[g(x)] and g[f(x)].

3. $f(x) = x - 8$
$g(x) = x + 8$

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

Find f[g(−3)] and g[f(−3)].

5. $f(x) = 9$
$g(x) = \frac{1}{x}$

6. $f(x) = \sqrt{x + 5}$
$g(x) = 2x + 8$

If f(x) = x², g(x) = 5x, and h(x) = x + 4, find each value.

7. $f[g(1)]$

8. $g[h(-2)]$

9. $h[f(4)]$

10. $f[h(-9)]$

Express g ∘ f and f ∘ g, if they exist, as sets of ordered pairs.

11. $f = \{(3, 8), (2, 5), (4, -5), (9, 3)\}$
$g = \{(9, 2), (-5, 3), (5, 9), (8, 10), (1, 9)\}$

12. $f = \{(1, 4), (10, 5), (6, -3)\}$
$g = \{(5, 1), (4, 6), (-3, 10)\}$

NAME _____ DATE _____

Practice

Student Edition
Pages 523–528

Composition of Functions

Find [f ∘ g](2) and [g ∘ f](2).

1. $f(x) = 2x - 1$
$g(x) = -3x$ **−13; −9**

2. $f(x) = x^2 - 5$
$g(x) = 3x^2 + 1$ **164; 4**

Find f[g(x)] and g[f(x)].

3. $f(x) = x - 8$
$g(x) = x + 8$ ***x; x***

4. $f(x) = x^2 - x + 3$
$g(x) = |x|$ **$x^2 - |x| + 3$; $|x^2 - x + 3|$**

Find f[g(−3)] and g[f(−3)].

5. $f(x) = 9$
$g(x) = \frac{1}{x}$ **9; $\frac{1}{9}$**

6. $f(x) = \sqrt{x + 5}$
$g(x) = 2x + 8$ **$\sqrt{7}$; $2\sqrt{2} + 8$**

If f(x) = x², g(x) = 5x, and h(x) = x + 4, find each value.

7. $f[g(1)]$ **25**

8. $g[h(-2)]$ **10**

9. $h[f(4)]$ **20**

10. $f[h(-9)]$ **25**

Express g ∘ f and f ∘ g, if they exist, as sets of ordered pairs.

11. $f = \{(3, 8), (2, 5), (4, -5), (9, 3)\}$
$g = \{(9, 2), (-5, 3), (5, 9), (8, 10), (1, 9)\}$
***g ∘ f* doesn't exist**
***f ∘ g* doesn't exist**

12. $f = \{(1, 4), (10, 5), (6, -3)\}$
$g = \{(5, 1), (4, 6), (-3, 10)\}$
***g ∘ f* = {(1, 6), (10, 1), (6, 10)}**
***f ∘ g* = {(5, 4), (4, −3), (−3, 5)}**

NAME _____ DATE _____

Practice

Student Edition
Pages 531–538

Inverse Functions and Relations

Find the inverse of each relation and determine whether the inverse is a function.

1. $f(x) = 2x + 5$

2. $y = 7$

3. $y = 3 - x$

4. $f(x) = x^2 - 1$

Determine whether each pair of functions are inverse functions.

5. $f(x) = x + 5$
$g(x) = x - 5$

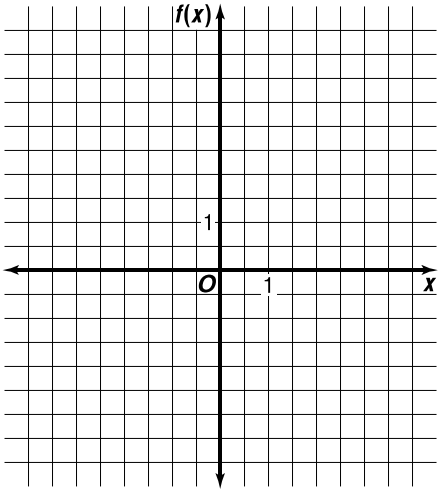
6. $f(x) = \frac{1}{2}x + 2$
$g(x) = 2x - 4$

7. $f(x) = 4 - x$
$g(x) = 4 + x$

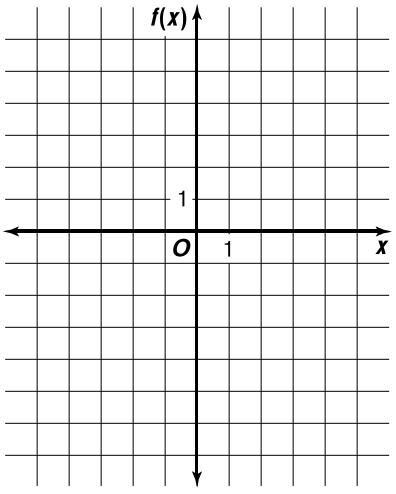
8. $f(x) = 3x - 9$
$g(x) = -3x + 9$

Find the inverse of each function. Then graph each function and its inverse.

9. $f(x) = x^2 - 3$



10. $f(x) = -4x$



NAME _____ DATE _____

Practice

Student Edition
Pages 531–538

Inverse Functions and Relations

Find the inverse of each relation and determine whether the inverse is a function.

1. $f(x) = 2x + 5$ $f^{-1}(x) = \frac{1}{2}x - \frac{5}{2}$; yes

2. $y = 7$ $x = 7$; no

3. $y = 3 - x$ $y = 3 - x$; yes

4. $f(x) = x^2 - 1$ $f^{-1}(x) = \pm\sqrt{x + 1}$; no

Determine whether each pair of functions are inverse functions.

5. $f(x) = x + 5$
   $g(x) = x - 5$ yes

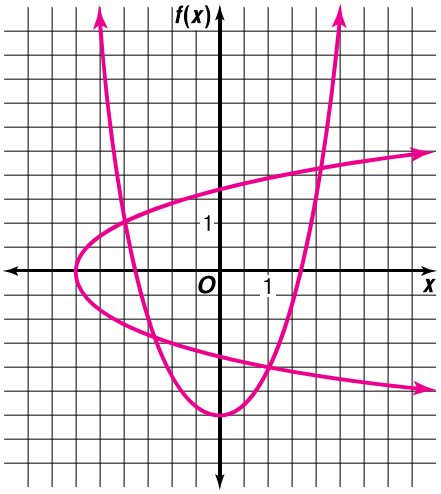
6. $f(x) = \frac{1}{2}x + 2$
   $g(x) = 2x - 4$ yes

7. $f(x) = 4 - x$
   $g(x) = 4 + x$ no

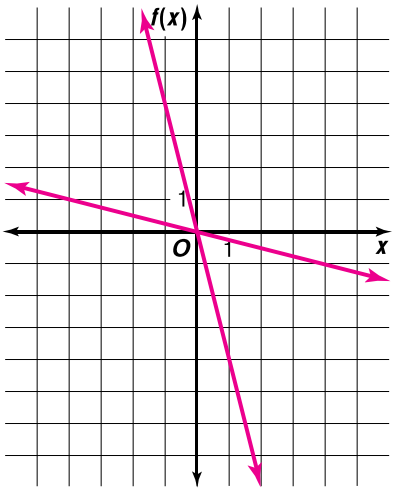
8. $f(x) = 3x - 9$
   $g(x) = -3x + 9$ no

Find the inverse of each function. Then graph each function and its inverse.

9. $f(x) = x^2 - 3$ $f^{-1}(x) = \pm\sqrt{x + 3}$



10. $f(x) = -4x$ $f^{-1}(x) = -\frac{1}{4}x$



NAME _____ DATE _____

Practice

Student Edition
Pages 562–568

Multiplying and Dividing Rational Expressions

Simplify each expression.

1. $\frac{a+y}{6} \cdot \frac{4}{y+a}$

2. $\frac{a-y}{w+n} \cdot \frac{w^2-n^2}{y-a}$

3. $\frac{x^2-5x-24}{6x+2x^2} \cdot \frac{5x^2}{8-x}$

4. $\frac{n^5}{n-6} \cdot \frac{n^2-6n}{n^8}$

5. $\frac{a^5y^3}{wy^7} \div \frac{a^3w^2}{w^5y^2}$

6. $\left(\frac{2xy}{w^2}\right)^3 \div \frac{24x^2}{w^5}$

7. $\frac{x+y}{6} \div \frac{x^2-y^2}{3}$

8. $\frac{3x+6}{x^2-9} \div \frac{6x^2+12x}{4x+12}$

9. $\dfrac{\frac{x^2-9}{4}}{\frac{3-x}{8}}$

10. $\dfrac{\frac{1}{x}+2}{\frac{4}{x}-1}$

11. $\dfrac{\frac{y^4-81}{xy+4y+3x+12}}{y^2+9}$

12. $\dfrac{\frac{x^3+2^3}{x^2-2x}}{\frac{(x+2)^3}{x^2+4x+4}}$

NAME _____ DATE _____

Practice

Student Edition
Pages 562–568

Multiplying and Dividing Rational Expressions

Simplify each expression.

1. $\frac{a+y}{6} \cdot \frac{4}{y+a}$ **$\frac{2}{3}$**

2. $\frac{a-y}{w+n} \cdot \frac{w^2-n^2}{y-a}$ **$n - w$**

3. $\frac{x^2-5x-24}{6x+2x^2} \cdot \frac{5x^2}{8-x}$ **$-\frac{5x}{2}$**

4. $\frac{n^5}{n-6} \cdot \frac{n^2-6n}{n^8}$ **$\frac{1}{n^2}$**

5. $\frac{a^5y^3}{wy^7} \div \frac{a^3w^2}{w^5y^2}$ **$\frac{a^2w^2}{y^2}$**

6. $\left(\frac{2xy}{w^2}\right)^3 \div \frac{24x^2}{w^5}$ **$\frac{xy^3}{3w}$**

7. $\frac{x+y}{6} \div \frac{x^2-y^2}{3}$ **$\frac{1}{2(x-y)}$**

8. $\frac{3x+6}{x^2-9} \div \frac{6x^2+12x}{4x+12}$ **$\frac{2}{x(x-3)}$**

9. $\frac{\frac{x^2-9}{4}}{\frac{3-x}{8}}$ **$-2(x+3)$**

10. $\frac{\frac{1}{x}+2}{\frac{4}{x}-1}$ **$\frac{1+2x}{4-x}$**

11. $\frac{\frac{y^4-81}{xy+4y+3x+12}}{y^2+9}$ **$\frac{y-3}{x+4}$**

12. $\frac{\frac{x^3+2^3}{x^2-2x}}{\frac{(x+2)^3}{x^2+4x+4}}$ **$\frac{x^2-2x+4}{x(x-2)}$**

NAME _____ DATE _____

Practice

Student Edition
Pages 569–575

Adding and Subtracting Rational Expressions

Simplify each expression.

1. $\frac{5}{6ab} - \frac{7}{8a}$

2. $2x - 5 - \frac{x - 8}{x + 4}$

3. $\frac{4}{a - 3} + \frac{9}{a - 5}$

4. $\frac{16}{x^2 - 16} + \frac{2}{x + 4}$

5. $\frac{5}{2x - 12} - \frac{20}{x^2 - 4x - 12}$

6. $\frac{2 - 5m}{m - 9} + \frac{4m - 5}{9 - m}$

7. $\frac{2p - 3}{p^2 - 5p + 6} - \frac{5}{p^2 - 9}$

8. $\frac{1}{5n} - \frac{3}{4} + \frac{7}{10n}$

9. $\dfrac{\frac{r + 6}{r} - \frac{1}{r + 2}}{\frac{r^2 + 4r + 3}{r^2 + r}}$

10. $\dfrac{n + 5 - \frac{12}{n + 1}}{\frac{n + 9}{n + 1} - \frac{5}{n}}$

11. $\dfrac{\frac{2}{x - y} + \frac{1}{x + y}}{\frac{1}{x - y}}$

12. $\dfrac{x - \frac{5x}{x + 2}}{\frac{x - 3}{x}}$

NAME _____ DATE _____

Practice

Student Edition
Pages 569–575

Adding and Subtracting Rational Expressions

Simplify each expression.

1. $\frac{5}{6ab} - \frac{7}{8a}$

$\frac{20 - 21b}{24ab}$

2. $2x - 5 - \frac{x - 8}{x + 4}$

$\frac{2(x + 3)(x - 2)}{x + 4}$

3. $\frac{4}{a - 3} + \frac{9}{a - 5}$

$\frac{13a - 47}{(a - 3)(a - 5)}$

4. $\frac{16}{x^2 - 16} + \frac{2}{x + 4}$

$\frac{2}{x - 4}$

5. $\frac{5}{2x - 12} - \frac{20}{x^2 - 4x - 12}$

$\frac{5}{2(x + 2)}$

6. $\frac{2 - 5m}{m - 9} + \frac{4m - 5}{9 - m}$

$\frac{7 - 9m}{m - 9}$

7. $\frac{2p - 3}{p^2 - 5p + 6} - \frac{5}{p^2 - 9}$

$\frac{2p^2 - 2p + 1}{(p - 2)(p + 3)(p - 3)}$

8. $\frac{1}{5n} - \frac{3}{4} + \frac{7}{10n}$

$\frac{3(6 - 5n)}{20n}$

9. $\frac{\frac{r + 6}{r} - \frac{1}{r + 2}}{\frac{r^2 + 4r + 3}{r^2 + r}}$

$\frac{r + 4}{r + 2}$

10. $\frac{n + 5 - \frac{12}{n + 1}}{\frac{n + 9}{n + 1} - \frac{5}{n}}$

$\frac{n(n + 7)}{n + 5}$

11. $\frac{\frac{2}{x - y} + \frac{1}{x + y}}{\frac{1}{x - y}}$

$\frac{3x + y}{x + y}$

12. $\frac{x - \frac{5x}{x + 2}}{\frac{x - 3}{x}}$

$\frac{x^2}{x + 2}$

NAME _____ DATE _____

Practice

Student Edition
Pages 576–583

Solving Rational Equations

Solve each equation. Check your solutions.

1. $\frac{12}{x} + \frac{3}{4} = \frac{3}{2}$

2. $\frac{x^2}{8} - 4 = \frac{x}{2}$

3. $\frac{x + 10}{x^2 - 2} = \frac{4}{x}$

4. $\frac{x}{x + 2} + x = \frac{5x + 8}{x + 2}$

5. $\frac{5}{x - 5} = \frac{x}{x - 5} - 1$

6. $\frac{1}{3x - 2} + \frac{5}{x} = 0$

7. $\frac{6}{x - 1} = \frac{4}{x - 2} + \frac{2}{x + 1}$

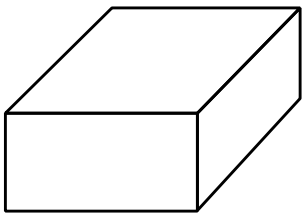
8. $\frac{x + 1}{x - 3} = 4 - \frac{12}{x^2 - 2x - 3}$

9. $\frac{1}{x - 1} = \frac{2}{x + 1} - \frac{1}{x + 3}$

10. $\frac{1}{x + 2} + \frac{1}{x - 2} = \frac{3}{x + 1}$

Solve.

11. The view of the rectangular box at the right shows three faces of the box. The areas of two of the faces are 30 cm^2 and 48 cm^2. The volume of the box is 240 cm^3. What is the area of the third face?



NAME _____ DATE _____

Practice

Student Edition
Pages 576–583

Solving Rational Equations

Solve each equation. Check your solutions.

1. $\frac{12}{x} + \frac{3}{4} = \frac{3}{2}$ **16**

2. $\frac{x^2}{8} - 4 = \frac{x}{2}$ **−4, 8**

3. $\frac{x + 10}{x^2 - 2} = \frac{4}{x}$ $-\frac{2}{3}$, **4**

4. $\frac{x}{x + 2} + x = \frac{5x + 8}{x + 2}$ **4**

5. $\frac{5}{x - 5} = \frac{x}{x - 5} - 1$ **all reals except 5**

6. $\frac{1}{3x - 2} + \frac{5}{x} = 0$ $\frac{5}{8}$

7. $\frac{6}{x - 1} = \frac{4}{x - 2} + \frac{2}{x + 1}$ **∅**

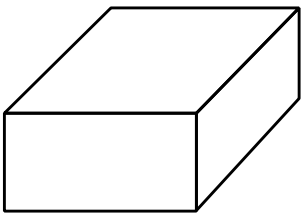
8. $\frac{x + 1}{x - 3} = 4 - \frac{12}{x^2 - 2x - 3}$ $-\frac{5}{3}$, **5**

9. $\frac{1}{x - 1} = \frac{2}{x + 1} - \frac{1}{x + 3}$ **∅**

10. $\frac{1}{x + 2} + \frac{1}{x - 2} = \frac{3}{x + 1}$ $1 \pm \sqrt{13}$

Solve.

11. The view of the rectangular box at the right shows three faces of the box. The areas of two of the faces are 30 cm^2 and 48 cm^2. The volume of the box is 240 cm^3. What is the area of the third face? **40 cm^2**



NAME _____ DATE _____

Practice

Student Edition
Pages 605–610

Logarithms and Logarithmic Functions

Write each equation in logarithmic form.

1. $5^3 = 125$

2. $27^{\frac{4}{3}} = 81$

Write each equation in exponential form.

3. $\log_{10} 0.00001 = -5$

4. $\log_{\frac{3}{2}} \frac{\sqrt{6}}{3} = -\frac{1}{2}$

Evaluate each expression.

5. $\log_3 81$

6. $\log_{10} 0.0001$

7. $\log_2 \frac{1}{16}$

8. $\log_{\frac{1}{3}} 27$

9. $\log_9 1$

10. $\log_8 4$

Solve each equation.

11. $\log_4 x = \frac{3}{2}$

12. $\log_y 16 = -4$

13. $\log_a \frac{1}{8} = -3$

14. $\log_7 n = -\frac{1}{2}$

15. $\log_{\sqrt{5}} y = \frac{4}{3}$

16. $\log_x \sqrt[3]{9} = \frac{1}{6}$

17. $\log_8(3x + 7) = \log_8(7x + 4)$

18. $\log_7(8x + 20) = \log_7(x + 6)$

19. $\log_3(9x - 1) = \log_3(4x - 16)$

20. $\log_{12}(x - 9) = \log_{12}(3x - 13)$

21. $\log_5(x^2 - 30) = \log_5 6$

22. $\log_4(x^2 + 6) = \log_4 5x$

NAME _____ DATE _____

Practice

Student Edition
Pages 605–610

Logarithms and Logarithmic Functions

Write each equation in logarithmic form.

1. $5^3 = 125$ $\log_5 125 = 3$

2. $27^{\frac{4}{3}} = 81$ $\log_{27} 81 = \frac{4}{3}$

Write each equation in exponential form.

3. $\log_{10} 0.00001 = -5$ $10^{-5} = 0.00001$

4. $\log_{\frac{3}{2}} \frac{\sqrt{6}}{3} = -\frac{1}{2}$ $\left(\frac{3}{2}\right)^{-\frac{1}{2}} = \frac{\sqrt{6}}{3}$

Evaluate each expression.

5. $\log_3 81$ 4

6. $\log_{10} 0.0001$ -4

7. $\log_2 \frac{1}{16}$ -4

8. $\log_{\frac{1}{3}} 27$ -3

9. $\log_9 1$ 0

10. $\log_8 4$ $\frac{2}{3}$

Solve each equation.

11. $\log_4 x = \frac{3}{2}$ 8

12. $\log_y 16 = -4$ $\frac{1}{2}$

13. $\log_a \frac{1}{8} = -3$ 2

14. $\log_7 n = -\frac{1}{2}$ $\frac{\sqrt{7}}{7}$

15. $\log_{\sqrt{5}} y = \frac{4}{3}$ $5^{\frac{2}{3}}$ or $\sqrt[3]{25}$

16. $\log_x \sqrt[3]{9} = \frac{1}{6}$ 81

17. $\log_8(3x + 7) = \log_8(7x + 4)$ $\frac{3}{4}$

18. $\log_7(8x + 20) = \log_7(x + 6)$ -2

19. $\log_3(9x - 1) = \log_3(4x - 16)$
no solution

20. $\log_{12}(x - 9) = \log_{12}(3x - 13)$
no solution

21. $\log_5(x^2 - 30) = \log_5 6$ ± 6

22. $\log_4(x^2 + 6) = \log_4 5x$ $2, 3$

NAME _____ DATE _____

Practice

Student Edition
Pages 626–630

Solving Exponential Equations

Use logarithms to solve each equation.

1. $3.5^{x} = 47.9$

2. $8.2^{y} = 64.5$

3. $7.2^{a-4} = 8.21$

4. $2^{b+1} = 7.31$

5. $y = \log_3 78.5$

6. $k = \log_4 91.8$

7. $4^{2x} = 9^{x-1}$

8. $7^{3b} = 12^{b+2}$

9. $17c^{\frac{2}{3}} = 44$

10. $7x^{\frac{9}{8}} = 111$

11. $5^{x^2-3} = 72$

12. $\sqrt[4]{3^{4x+5}} = 7^{x}$

Solve.

13. Jim wants to paint the walls of a room that is 15 feet wide and 20 feet long. The ceiling is 8 feet high. How many gallons of paint will he need if each gallon covers 350 square feet and he wants to give the room two coats of paint?

NAME _____ DATE _____

Practice

Student Edition
Pages 626–630

Solving Exponential Equations

Use logarithms to solve each equation.

1. $3.5^{x} = 47.9$ **3.0885**

2. $8.2^{y} = 64.5$ **1.9802**

3. $7.2^{a-4} = 8.21$ **5.0665**

4. $2^{b+1} = 7.31$ **1.8699**

5. $y = \log_{3} 78.5$ **3.9715**

6. $k = \log_{4} 91.8$ **3.2602**

7. $4^{2x} = 9^{x-1}$ **−3.8188**

8. $7^{3b} = 12^{b+2}$ **1.4823**

9. $17c^{\frac{2}{3}} = 44$ **4.1640**

10. $7x^{\frac{9}{8}} = 111$ **11.6645**

11. $5^{x^2-3} = 72$ **±2.3785**

12. $\sqrt[4]{3^{4x+5}} = 7^{x}$ **1.6208**

Solve.

13. Jim wants to paint the walls of a room that is 15 feet wide and 20 feet long. The ceiling is 8 feet high. How many gallons of paint will he need if each gallon covers 350 square feet and he wants to give the room two coats of paint?
4 gallons

NAME _____ DATE _____

Practice

Student Edition
Pages 648–655

Arithmetic Sequences

Find the nth term of each arithmetic sequence.

1. $a_1 = -5, d = 4, n = 9$

2. $a_1 = 13, d = -\frac{5}{2}, n = 29$

3. $a_1 = 3, d = -4, n = 6$

4. $a_1 = -5, d = \frac{1}{2}, n = 10$

Complete each statement.

5. 97 is the ___?___th term of $-3, 1, 5, 9, \cdots$.

6. -10 is the ___?___th term of $14, 12.5, 11, 9.5, \cdots$.

Find the indicated term in each arithmetic sequence.

7. a_{15} for $-3, 3, 9, \cdots$

8. a_{19} for $17, 12, 7, \cdots$

9. a_{26} for $1, \frac{7}{3}, \frac{11}{3}, \cdots$

10. a_{35} for $17, 16\frac{2}{3}, 16\frac{1}{3}, \cdots$

Find the missing terms in each arithmetic sequence.

11. 3, _____, _____, 20

12. _____, -10, _____, _____, _____, 14

13. 5, _____, _____, 27

14. _____, 4, _____, _____, _____, 29

15. How many multiples of 11 are there between 13 and 384?

NAME _____ DATE _____

Practice

Student Edition
Pages 648–655

Arithmetic Sequences

Find the nth term of each arithmetic sequence.

1. $a_1 = -5, d = 4, n = 9$
27

2. $a_1 = 13, d = -\frac{5}{2}, n = 29$
-57

3. $a_1 = 3, d = -4, n = 6$
-17

4. $a_1 = -5, d = \frac{1}{2}, n = 10$
$-\frac{1}{2}$

Complete each statement.

5. 97 is the ___?___th term of $-3, 1, 5, 9, \cdots$. 26

6. -10 is the ___?___th term of $14, 12.5, 11, 9.5, \cdots$. 17

Find the indicated term in each arithmetic sequence.

7. a_{15} for $-3, 3, 9, \cdots$
81

8. a_{19} for $17, 12, 7, \cdots$
-73

9. a_{26} for $1, \frac{7}{3}, \frac{11}{3}, \cdots$
$\frac{103}{3}$

10. a_{35} for $17, 16\frac{2}{3}, 16\frac{1}{3}, \cdots$
$\frac{17}{3}$

Find the missing terms in each arithmetic sequence.

11. $3,$ _____, _____, 20
$8\frac{2}{3}, 14\frac{1}{3}$

12. _____, $-10,$ _____, _____, _____, 14
$-16, -4, 2, 8$

13. $5,$ _____, _____, 27
$12\frac{1}{3}, 19\frac{2}{3}$

14. _____, $4,$ _____, _____, _____, 29
$-2\frac{1}{4}, 10\frac{1}{4}, 16\frac{1}{2}, 22\frac{3}{4}$

15. How many multiples of 11 are there between 13 and 384?
33

NAME _____ DATE _____

Practice

Student Edition
Pages 656–661

Arithmetic Series

Find S_n for each arithmetic series described.

1. $a_1 = 16, a_n = 98, n = 13$

2. $a_1 = 13, d = -6, n = 21$

3. $d = -\frac{2}{3}, n = 16, a_n = 44$

4. $a_1 = -121, d = 3, a_n = 5$

Find the sum of each arithmetic series.

5. $5 + 7 + 9 + \cdots + 27$

6. $-4 + 1 + 6 + \cdots + 91$

7. $13 + 20 + 27 + \cdots + 272$

8. $89 + 86 + 83 + \cdots + 20$

9. $\sum_{k=3}^{8} (5k - 10)$

10. $\sum_{p=4}^{10} (2p + 1)$

11. $\sum_{n=1}^{6} (3n + 5)$

12. $\sum_{j=1}^{5} (9 - 4j)$

Find the first three terms of each arithmetic series.

13. $a_1 = 14, a_n = -85, S_n = -1207$

14. $n = 16, a_n = 15, S_n = -120$

Solve.

15. A display in a grocery store has 1 can on the top row, 2 cans on the 2nd row, 3 cans on the 3rd row, and so on. How many cans are needed to make 25 rows?

NAME _____ DATE _____

Practice

Student Edition
Pages 656–661

Arithmetic Series

Find S_n for each arithmetic series described.

1. $a_1 = 16, a_n = 98, n = 13$ **741**

2. $a_1 = 13, d = -6, n = 21$ **−987**

3. $d = -\frac{2}{3}, n = 16, a_n = 44$ **784**

4. $a_1 = -121, d = 3, a_n = 5$ **−2494**

Find the sum of each arithmetic series.

5. $5 + 7 + 9 + \cdots + 27$
192

6. $-4 + 1 + 6 + \cdots + 91$
870

7. $13 + 20 + 27 + \cdots + 272$
5415

8. $89 + 86 + 83 + \cdots + 20$
1308

9. $\sum_{k=3}^{8} (5k - 10)$
105

10. $\sum_{p=4}^{10} (2p + 1)$
105

11. $\sum_{n=1}^{6} (3n + 5)$
93

12. $\sum_{j=1}^{5} (9 - 4j)$
−15

Find the first three terms of each arithmetic series.

13. $a_1 = 14, a_n = -85, S_n = -1207$
14, 11, 8

14. $n = 16, a_n = 15, S_n = -120$
−30, −27, −24

Solve.

15. A display in a grocery store has 1 can on the top row, 2 cans on the 2nd row, 3 cans on the 3rd row, and so on. How many cans are needed to make 25 rows? **325**

NAME _____ DATE _____

Practice

Student Edition
Pages 662–669

Geometric Sequences

Find the first four terms of each geometric sequence.

1. $a_1 = -6, r = -\frac{2}{3}$

2. $a_1 = 2, r = \sqrt{3}$

3. $a_1 = -\frac{5}{2}, r = 2$

4. $a_1 = \sqrt{2}, r = \sqrt{3}$

Find the nth term of each geometric sequence.

5. $a_1 = 5, n = 4, r = 3$

6. $a_4 = 20, n = 6, r = -3$

7. $a_1 = -4, n = 6, r = -2$

8. $a_6 = 8, n = 12, r = \frac{1}{2}$

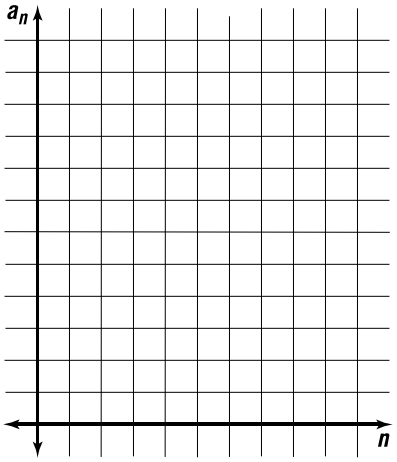
Solve.

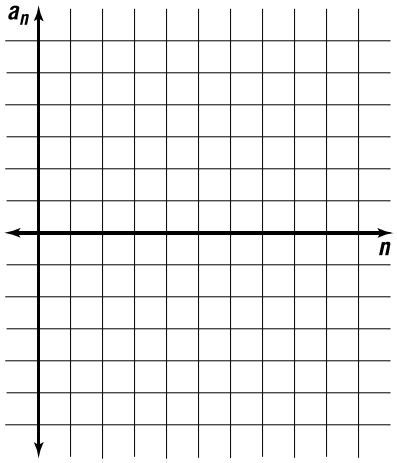
9. Each foot of water screens out 60% of the light above. What percent of the light remains after passing through 5 feet of water?

Find the geometric means in each sequence. Then graph each sequence, using the x-axis for the number of the term and the y-axis for the term itself.

10. _____, _____, 2, _____, _____, 54

11. 32, _____, _____, _____, 162





NAME _____ DATE _____

Practice

Student Edition
Pages 662–669

Geometric Sequences

Find the first four terms of each geometric sequence.

1. $a_1 = -6, r = -\frac{2}{3}$

−6, 4, $-\frac{8}{3}$, $\frac{16}{9}$

2. $a_1 = 2, r = \sqrt{3}$

$2, 2\sqrt{3}, 6, 6\sqrt{3}$

3. $a_1 = -\frac{5}{2}, r = 2$

$-\frac{5}{2}$, −5, −10, −20

4. $a_1 = \sqrt{2}, r = \sqrt{3}$

$\sqrt{2}, \sqrt{6}, 3\sqrt{2}, 3\sqrt{6}$

Find the nth term of each geometric sequence.

5. $a_1 = 5, n = 4, r = 3$ **135**

6. $a_4 = 20, n = 6, r = -3$ **180**

7. $a_1 = -4, n = 6, r = -2$ **128**

8. $a_6 = 8, n = 12, r = \frac{1}{2}$ **$\frac{1}{8}$**

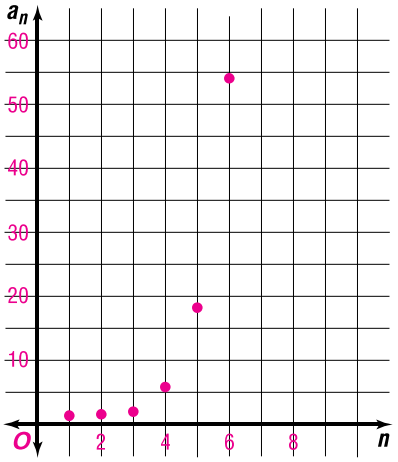
Solve.

9. Each foot of water screens out 60% of the light above. What percent of the light remains after passing through 5 feet of water? **1.024%**

Find the geometric means in each sequence. Then graph each sequence, using the x-axis for the number of the term and the y-axis for the term itself.

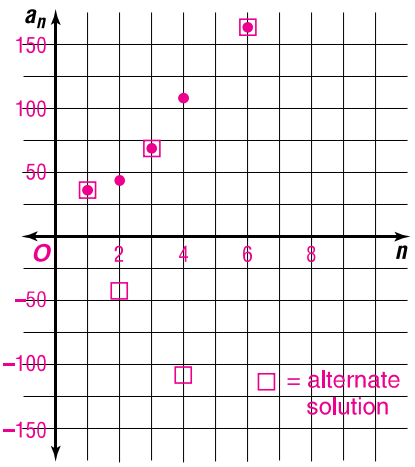
10. _____, _____, 2, _____, _____, 54

$\frac{2}{9}, \frac{2}{3}$, 6, 18



11. 32, _____, _____, _____, 162

48, 72, 108, or −48, 72, −108



NAME _____ DATE _____

Practice

Student Edition
Pages 670–675

Geometric Series

Find the sum of each geometric series.

1. $160 + 80 + 40 + \cdots, n = 6$

2. $a_1 = 5, r = -\frac{1}{2}, n = 7$

3. $a_2 = \frac{-3}{8}, a_3 = \frac{1}{4}, n = 5$

4. $a_3 = 8, a_5 = 2, n = 6$

Express each series in sigma notation and find the sum.

5. $54 + 18 + 6 + 2 + \frac{2}{3} + \frac{2}{9}$

6. $16 - 24 + 36 - 54 + 81 - 121.5 + 182.25$

Find a_1 for each geometric series described.

7. $S_n = -55, r = -\frac{2}{3}, n = 5$

8. $S_n = 2457, a_n = 3072, r = -4$

Solve.

9. A pile driver drives a post 9 feet into the ground on its first hit. Each additional hit drives the post $\frac{2}{3}$ the distance of the prior hit. Find the total distance the post has been driven after 4 hits.

10. In problem 9, what is the greatest distance the pole could be driven into the ground?

11. Hugh Moore makes up a joke and tells it to his 5 closest friends on Sunday morning. Each of those friends tells his or her 5 closest friends on Monday morning, and so on. Assuming no duplication, how many people will have heard the joke by the end of Saturday?

NAME _____ DATE _____

Practice

Student Edition
Pages 670–675

Geometric Series

Find the sum of each geometric series.

1. $160 + 80 + 40 + \cdots, n = 6$ **315**

2. $a_1 = 5, r = -\frac{1}{2}, n = 7$ $\frac{215}{64}$

3. $a_2 = \frac{-3}{8}, a_3 = \frac{1}{4}, n = 5$ $\frac{58}{144}$

4. $a_3 = 8, a_5 = 2, n = 6$ **21 or 63**

Express each series in sigma notation and find the sum.

5. $54 + 18 + 6 + 2 + \frac{2}{3} + \frac{2}{9}$

$\sum_{n=1}^{6} 54\left(\frac{1}{3}\right)^{n-1}$

6. $16 - 24 + 36 - 54 + 81 - 121.5 + 182.25$

$\sum_{n=1}^{7} 16\left(-\frac{3}{2}\right)^{n-1}$

Find a_1 for each geometric series described.

7. $S_n = -55, r = -\frac{2}{3}, n = 5$ **−81**

8. $S_n = 2457, a_n = 3072, r = -4$ **−3**

Solve.

9. A pile driver drives a post 9 feet into the ground on its first hit. Each additional hit drives the post $\frac{2}{3}$ the distance of the prior hit. Find the total distance the post has been driven after 4 hits. $21\frac{2}{3}$ **ft**

10. In problem 9, what is the greatest distance the pole could be driven into the ground? **27 ft**

11. Hugh Moore makes up a joke and tells it to his 5 closest friends on Sunday morning. Each of those friends tells his or her 5 closest friends on Monday morning, and so on. Assuming no duplication, how many people will have heard the joke by the end of Saturday? **97,655; 97,656 if Hugh is included**

NAME _____ DATE _____

Practice

Student Edition
Pages 676–682

Infinite Geometric Series

Find the sum of each infinite geometric series, if it exists.

1. $a_1 = 35, r = \frac{2}{7}$

2. $18 - 6 + 2 - \cdots$

3. $\frac{4}{25} + \frac{2}{5} + 1 + \cdots$

4. $6 + 4 + \frac{8}{3} + \cdots$

5. $10 + 1 + 0.1 + \cdots$

6. $2 + 6 + 18 + \cdots$

7. $a_1 = 26, r = \frac{1}{2}$

8. $a_1 = 108, r = -\frac{3}{4}$

9. $a_1 = 42, r = \frac{6}{5}$

10. $a_1 = 50, r = \frac{2}{5}$

Express each decimal as a rational number of the form $\frac{a}{b}$.

11. $0.4\overline{9}$

12. $0.\overline{164}$

13. $0.2\overline{8}$

14. $0.6\overline{41}$

Find the first three terms of each infinite geometric series.

15. $S = 64, r = -\frac{3}{4}$

16. $S = 625, r = \frac{1}{5}$

17. $S = 90, r = -\frac{1}{2}$

18. $S = 4, r = \frac{1}{3}$

NAME _____ DATE _____

Practice

Student Edition
Pages 676–682

Infinite Geometric Series

Find the sum of each infinite geometric series, if it exists.

1. $a_1 = 35, r = \frac{2}{7}$ **49**

2. $18 - 6 + 2 - \cdots$ **$\frac{27}{2}$**

3. $\frac{4}{25} + \frac{2}{5} + 1 + \cdots$ **does not exist**

4. $6 + 4 + \frac{8}{3} + \cdots$ **18**

5. $10 + 1 + 0.1 + \cdots$ **$\frac{100}{9}$**

6. $2 + 6 + 18 + \cdots$ **does not exist**

7. $a_1 = 26, r = \frac{1}{2}$ **52**

8. $a_1 = 108, r = -\frac{3}{4}$ **$\frac{432}{7}$**

9. $a_1 = 42, r = \frac{6}{5}$ **does not exist**

10. $a_1 = 50, r = \frac{2}{5}$ **$\frac{250}{3}$**

Express each decimal as a rational number of the form $\frac{a}{b}$.

11. $0.4\overline{9}$ **$0.49 + 0.009 + 0.0009 + \cdots; \frac{1}{2}$**

12. $0.\overline{164}$ **$0.164 + 0.000164 + 0.000000164 + \cdots; \frac{164}{999}$**

13. $0.2\overline{8}$ **$0.28 + 0.008 + 0.0008 + \cdots; \frac{13}{45}$**

14. $0.6\overline{41}$ **$0.641 + 0.00041 + 0.0000041 + \cdots; \frac{127}{198}$**

Find the first three terms of each infinite geometric series.

15. $S = 64, r = -\frac{3}{4}$ **$112 - 84 + 63$**

16. $S = 625, r = \frac{1}{5}$ **$500 + 100 + 20$**

17. $S = 90, r = -\frac{1}{2}$
$135 - 67.5 + 33.75$

18. $S = 4, r = \frac{1}{3}$
$\frac{8}{3} + \frac{8}{9} + \frac{8}{27}$

NAME _____ DATE _____

Practice

Student Edition
Pages 780–785

Angles and Their Measure

Change each degree measure to radian measure.

1. $18°$

2. $-72°$

3. $-820°$

4. $6°$

5. $-250°$

6. $870°$

7. $347°$

8. $-165°$

9. $2\pi°$

10. $-\frac{4}{3}\pi°$

Change each radian measure to degree measure.

11. 4π

12. $\frac{5}{2}\pi$

13. $\frac{-7}{9}\pi$

14. $2\frac{3}{5}\pi$

15. $\frac{13}{30}\pi$

16. $-\frac{4}{7}\pi$

17. 4

18. $-\frac{5}{2}$

19. $\frac{5\pi}{4}$

20. $\frac{3\pi}{16}$

NAME _____ DATE _____

Practice

Student Edition
Pages 780–785

Angles and Their Measure

Change each degree measure to radian measure.

1. $18°$ $\frac{\pi}{10}$
2. $-72°$ $-\frac{2\pi}{5}$
3. $-820°$ $-\frac{41\pi}{9}$
4. $6°$ $\frac{\pi}{30}$
5. $-250°$ $-\frac{25\pi}{18}$
6. $870°$ $\frac{29\pi}{6}$
7. $347°$ $\frac{347\pi}{180}$
8. $-165°$ $-\frac{11\pi}{12}$
9. $2\pi°$ $\frac{\pi^2}{90}$
10. $-\frac{4}{3}\pi°$ $-\frac{\pi^2}{135}$

Change each radian measure to degree measure.

11. 4π $720°$
12. $\frac{5}{2}\pi$ $450°$
13. $\frac{-7}{9}\pi$ $-140°$
14. $2\frac{3}{5}\pi$ $468°$
15. $\frac{13}{30}\pi$ $78°$
16. $-\frac{4}{7}\pi$ $-102.86°$
17. 4 $\frac{720°}{\pi} \approx 229.18$
18. $-\frac{5}{2}$ $-\frac{450°}{\pi} \approx -143.24$
19. $\frac{5\pi}{4}$ $225°$
20. $\frac{3\pi}{16}$ $33.75°$

NAME _____ DATE _____

Practice

Student Edition
Pages 786–791

Trigonometric Functions of General Angles

Find the exact value of each trigonometric function.

1. $\tan 135°$

2. $\sec \frac{\pi}{6}$

3. $\csc -\frac{\pi}{6}$

4. $\cot 210°$

5. $\sec 210°$

6. $\csc\left(-\frac{3}{4}\pi\right)$

7. $\tan \frac{5}{3}\pi$

8. $\cot(-405°)$

9. $\csc(-390°)$

10. $\sec 270°$

11. $\cot(-87\pi)$

12. $\tan \frac{13}{6}\pi$

13. $\sec(-225°)$

14. $\csc 4\frac{2}{3}\pi$

15. $\tan(-720°)$

16. $\cot(-90°)$

17. $\sec 330°$

18. $\csc -\frac{11\pi}{6}$

19. $\cot \frac{9\pi}{4}$

20. $\tan -\frac{3\pi}{4}$

NAME _____ DATE _____

Practice

Student Edition
Pages 786–791

Trigonometric Functions of General Angles

Find the exact value of each trigonometric function.

1. $\tan 135°$ -1

2. $\sec \frac{\pi}{6}$ $\frac{2\sqrt{3}}{3}$

3. $\csc -\frac{\pi}{6}$ -2

4. $\cot 210°$ $\sqrt{3}$

5. $\sec 210°$ $-\frac{2\sqrt{3}}{3}$

6. $\csc\left(-\frac{3}{4}\pi\right)$ $-\sqrt{2}$

7. $\tan \frac{5}{3}\pi$ $-\sqrt{3}$

8. $\cot(-405°)$ -1

9. $\csc(-390°)$ -2

10. $\sec 270°$ undefined

11. $\cot(-87\pi)$ undefined

12. $\tan \frac{13}{6}\pi$ $\frac{\sqrt{3}}{3}$

13. $\sec(-225°)$ $-\sqrt{2}$

14. $\csc 4\frac{2}{3}\pi$ $\frac{2\sqrt{3}}{3}$

15. $\tan(-720°)$ 0

16. $\cot(-90°)$ 0

17. $\sec 330°$ $\frac{2\sqrt{3}}{3}$

18. $\csc -\frac{11\pi}{6}$ 2

19. $\cot \frac{9\pi}{4}$ 1

20. $\tan -\frac{3\pi}{4}$ 1