For Exercises 1 and 2, evaluate the exponential form.

1. 3^{-4} 1. _____

2. $\left(\dfrac{2}{5}\right)^3$ 2. _____

3. Write 34,590,000 in scientific notation.   3. _____

4. Write 6.9025×10^{-4} in standard form.   4. _____

For Exercises 5 and 6, identify the degree.

5. $4x^2 - 9x^4 - 12 + 7x^5 - 3x^3 - x$ 5. _____

6. $-3x^5y^2$ 6. _____

7. Evaluate $-2x^3 - 5xy^2$ when $x = -1$, and $y = -3$.   7. _____

8. Combine like terms and write the resulting
    polynomial in descending order of degree:
                                                                                              8. _____
    $$5x^2 - 4x^3 + 7x^4 + 4x - 9x^2 + 8x^3 - 3$$

9. Add:
                                                                                              9. _____
    $$(8x^2 - 5x + 2) + (2x^2 - 6x - 3)$$

10. Subtract:
                                                                                              10. _____
    $$(-5x^2 + 6x - 7) - (-5x^2 - 6x + 7)$$

For Exercises 11–15, multiply.

11. $(-3x^4)(-9x^3)$ 11. _____

12. $(2x^3y^4)(-3x^5y)$ 12. _____

13. $(-2x^2y^3)^4$ 13. _____

14. $-5x^3(3x^2 + 5x - 7)$ 14. _____

15. $-7x^3y^2(2x^5 - 3y^5x^3)$ 15. _____
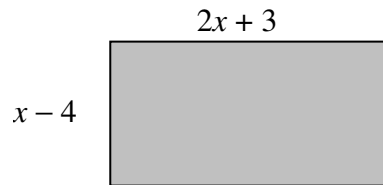
For Exercises 16–18, multiply.

16. $(3x - 4)(5x + 2)$ 16.   _____

17. $(5x - 3)^2$ 17.   _____

18. $(7x - 2)(5x^2 + 4x - 3)$ 18.   _____

19.   Write an expression for the area of the figure shown.

$$2x + 3$$

$x - 4$

19.   _____

For Exercises 20–25, simplify.

20. $x^{12} \div x^3$ 20.   _____

21. $\dfrac{\left(x^5\right)^{-2}}{x^6 \cdot x^{-3}}$ 21.   _____

22. $\dfrac{(3y)^{-3}}{\left(x^5 y^2\right)^{-1}}$ 22.   _____

23. $\dfrac{24x^5 - 12x^2}{4x^2}$ 23.   _____

24. $\dfrac{6x^2 + x - 2}{2x - 1}$ 24.   _____

25. $\dfrac{5x^3 + 18x^2 + 8x - 3}{x + 3}$ 25.   _____

For Exercises 1 and 2, evaluate the exponential form.

1. 4^{-1}

1. _____

2. $\left(\dfrac{5}{7}\right)^{-2}$

2. _____

3. Write 703,000,000 in scientific notation.

3. _____

4. Write 8.032×10^{-4} in standard form.

4. _____

For Exercises 5 and 6, identify the degree.

5. $7x^2 - 6x^5 - 3x^3 - 7x + 9$

5. _____

6. $-5x^7y^3$

6. _____

7. Evaluate $-2x^2 - 2xy^3$ when $x = -2$ and $y = -1$.

7. _____

8. Combine like terms and write the resulting polynomial in descending order of degree:

8. _____

$$4x^2 - 6x^3 + 3x^4 - 5x^2 - 7x^4 + 4 + 6x^3$$

9. Add:

9. _____

$$(5x^2 - 7x + 4) + (6x^2 - 8x - 7)$$

10. Subtract:

10. _____

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

For Exercises 11–15, multiply.

11. $(2x^5)(-5x^7)$

11. _____

12. $(3xy^4)(-5x^3y^2)$

12. _____

13. $(-2x^3y^5)^4$

13. _____

14. $-3x^4(6x^2 + 4x - 1)$

14. _____

15. $-2x^7y^2(8x^4 - 2y^3x^5)$

15. _____

For Exercises 16–18, multiply.

16. $(2x - 5y)(7x + 3y)$ 16. _____
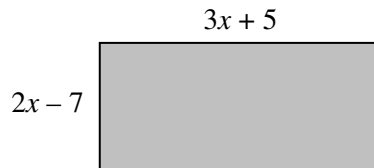
17. $(2x - 7)^2$ 17. _____

18. $(2x - 3)(4x^2 + 5x - 6)$ 18. _____

19. Write an expression for the area of the figure shown.   19. _____

$$3x + 5$$

$2x - 7$

For Exercises 20–25, simplify.

20. $x^{12} \div x^6$ 20. _____

21. $\dfrac{\left(x^2\right)^{-3}}{x^7 \cdot x^{-5}}$ 21. _____

22. $\dfrac{(2y)^{-3}}{\left(x^5 y^7\right)^{-2}}$ 22. _____

23. $\dfrac{56x^3 - 8x^2}{8x}$ 23. _____

24. $\dfrac{6x^2 - 7x + 2}{3x - 2}$ 24. _____

25. $\dfrac{2x^3 + 3x^2 - 3x + 4}{x + 2}$ 25. _____

For Exercises 1 and 2, evaluate the exponential form.

1. 5^{-3}

1. _____

2. $\left(\dfrac{4}{7}\right)^{-2}$

2. _____

3. Write 150,670 in scientific notation.

3. _____

4. Write 3.7309×10^{-2} in standard form.

4. _____

For Exercises 5 and 6, identify the degree.

5. $-6x^5 + 4x^3 - 9x + 3$

5. _____

6. $-3x^4y^6$

6. _____

7. Evaluate $2x^3 - 3xy^2$ when $x = -1$ and $y = -2$.

7. _____

8. Combine like terms and write the resulting polynomial in descending order of degree:

    $4x^2 - 9x^5 + 5x^7 + 7x^5 - 9x^2 - 5x^7 - 6$

8. _____

9. Add:

    $(7x^2 - 5x + 2) + (6x^2 - 5x - 4)$

9. _____

10. Subtract:

    $(-4x^2 + 2x - 1) - (-9x^2 - 6x + 3)$

10. _____

For Exercises 11–15, multiply.

11. $(3x^5)(-9x^7)$

11. _____

12. $(-3x^5y^2)(-6x^3y^7)$

12. _____

13. $(-2x^4y^6)^3$

13. _____

14. $-5x^5(2x^4 + 3x^2 - 4x)$

14. _____

15. $3x^2y^5(7x^6 - 2y^3x^4)$

15. _____

For Exercises 16–18, multiply.

16. $(2x - 3)(7x + 1)$ 16. _____
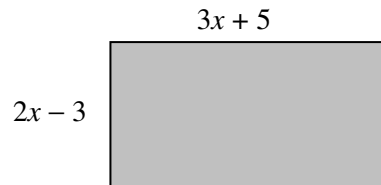
17. $(3x - 7)^2$ 17. _____

18. $(2x - 3)(4x^2 + 6x + 9)$ 18. _____

19. Write an expression for the area of the figure shown.

$3x + 5$

$2x - 3$ 19. _____

For Exercises 20–25, simplify.

20. $x^{16} \div x^4$ 20. _____

21. $\dfrac{\left(y^4\right)^{-1}}{y^5 \cdot y^{-3}}$ 21. _____

22. $\dfrac{\left(-4y\right)^2}{\left(2x^3 y^4\right)^{-3}}$ 22. _____

23. $\dfrac{25x^5 - 15x^3 + 10x^2}{5x^2}$ 23. _____

24. $\dfrac{2x^2 + 3x - 14}{2x + 7}$ 24. _____

25. $\dfrac{2x^3 + 9x^2 + 5x - 12}{x + 3}$ 25. _____

ELEMENTARY AND INTERMEDIATE ALGEBRA Name:

For Exercises 1 and 2, evaluate the exponential form.

1. $-(-3)^{-3}$

1. _____

2. $-\left(\dfrac{3}{8}\right)^{-2}$

2. _____

3. Write 609,800,000 in scientific notation.

3. _____

4. Write 7.372×10^{-4} in standard form.

4. _____

For Exercises 5 and 6, identify the degree.

5. $6x^2 - 7x^3 - 10 + 11x^6 - 5x$

5. _____

6. $-3x^4y^3z^2$

6. _____

7. Evaluate $-3x^2y^3 - 2y^4x^2$ when $x = -1$ and $y = -2$.

7. _____

8. Combine like terms and write the resulting polynomial in descending order of degree:

8. _____

$$5xy + 4x^2y - 7y + 9xy^2 + 4y - 9x^2y + 8xy - 3xy^2$$

9. Add:

9. _____

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

10. Subtract:

10. _____

$$(-8x^5 + 7x^3 - 8x + 14) - (-9x^3 - 5x^2 + 11)$$

For Exercises 11–15, multiply.

11. $(-5x^4)(-3x^5)(2x^3)$

11. _____

12. $(6x^3y^5)(-9x^3y^2)(-\dfrac{1}{3}xy)^2$

12. _____

13. $(-3x^3y^2)^2(-2xy^3)^3$

13. _____

14. $-2x^5(-5x^3 + 7x^2 - 6x + 4)$

14. _____

15. $-6x^3y^5(4x^5y^2 - 3y^4x^2)$

15. _____

For Exercises 16–18, multiply.

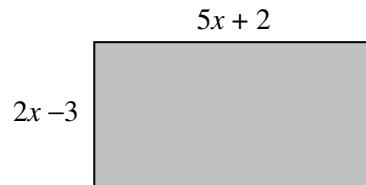16. $(5x - 2y)(4x + 7y)$ 16. _____

17. $(7 - 3y)^2$ 17. _____

18. $(3x^2 - 2x + 1)(3x^2 - 4x + 5)$ 18. _____

19. Write an expression for the area of the figure shown.

$5x + 2$

$2x - 3$

19. _____

For Exercises 20–25, simplify.

20. $12x^8y^3 \div 6x^2y$ 20. _____

21. $\dfrac{\left(-2x^{-2}y\right)^3}{x^5y^{-2}}$ 21. _____

22. $\dfrac{\left(-3x^4y\right)^{-2}}{3^{-1}x^{-3}y^5}$ 22. _____

23. $\dfrac{32a^2b^4 - 16ab + 12a - 24a^2b^3}{-4a^2b^3}$ 23. _____

24. $\dfrac{3x^3 + 20x^2 + 21x - 20}{x + 5}$ 24. _____

25. $\dfrac{x^3 - 64}{x - 4}$ 25. _____

For Exercises 1 and 2, evaluate the exponential form.

1. -3^2

    (a) 9   (b) -9 (c) 6   (d) -6

1. _____

2. $\left(\dfrac{5}{3}\right)^{-3}$

    (a) $-\dfrac{125}{27}$ (b) $\dfrac{27}{125}$ (c) $\dfrac{125}{27}$ (d) $-\dfrac{27}{125}$

2. _____

3. Write 60,380,000 in scientific notation.

    (a) 6.038×10^7 (b) 6.038×10^6 (c) 6.038×10^{-7} (d) 60.8×10^6

3. _____

4. Write 4.12×10^{-3} in standard form.

    (a) 0.0412   (b) 0.000412   (c) 0.00412   (d) 4120

4. _____

5. The degree of $5x^2 - 3x^4 + 2x^3 - x + 7$ is:

    (a) 2   (b) 4   (c) 9   (d) 10

5. _____

6. Which term has a degree of 6?

    (1) $3x^5y$ (2) $-2xy^5$ (3) $7xy^5$

    (a) 2 and 3   (b) 1 and 3   (c) 1 and 2   (d) all of these

6. _____

7. Evaluate $4 - a^3$ when $a = -2$.

    (a) -4 (b) 4   (c) 12   (d) 0

7. _____

8. Combine like terms and write the resulting polynomial in descending order of degree:

    $2 - 10x^2 - 9x^3 + 7 + 6x^2 - 5x + 18x^3 + 4$

    (a) $9x^3 - 4x^2 - 5x + 13$ (c) $9x^3 - 4x^2 + 5x - 5$

    (b) $9x^3 - 16x^2 - 5x - 5$ (d) $13x^6$

8. _____

9. Add:

    $(-11x^2 - 6x + 1) + (7x^2 + 10x - 8)$

    (a) $-4x^2 + 16x + 7$ (c) $-4x^2 + 16x - 7$

    (b) $-4x^2 + 4x - 7$ (d) $-77x^4 - 60x - 8$

9. _____

10. Subtract:

10. _____

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

(a) $2x^3 + 15x^2 + 3x - 7$ (c) $-2x^3 + 15x^2 - 3x - 7$

(b) $2x^3 - 5x^2 + 3x - 7$ (d) $2x^3 - 5x^2 - 3x + 13$

For Exercises 11–18, multiply.

11. $x^5(3x^4)$

11. _____

(a) $3x^9$ (b) $3x^{20}$ (c) $81y^9$ (d) $81y^{20}$

12. $(7x^4y^2)(-8x^3y^4)$

12. _____

(a) $56x^7y^6$ (b) $56x^4y^4$ (c) $-56x^7y^6$ (d) $-56x^4y^4$

13. $(3xy^3)^3(xy)^4$

13. _____

(a) $27x^7y^{13}$ (b) $27x^7y^7$ (c) $3x^7y^{13}$ (d) $3x^4y^{13}$

14. $3x(-4x^2 + 5x - 6)$

14. _____

(a) $-12x^3 + 15x^2 - 6$ (c) $-12x^3 + 15x^2 - 18x$

(b) $-12x^3 + 5x - 6$ (d) $-x^3 + 8x^2 - 3x$

15. $-2x^3y(3x^3 - 4xy^2 - 5y^3)$

15. _____

(a) $-6x^9y - 8xy^2 - 5y^3$ (c) $-6x^6y + 8x^4y^3 + 10x^3y^4$

(b) $-6x^6y^4 + 8x^4y^3 + 10x^6y^4$ (d) $-6x^9y + 8x^3y^2 + 10x^3y^3$

16. $(4x - 7)(3x - 5)$

16. _____

(a) $12x^2 - 41x + 35$ (c) $12x^2 - 41x - 35$

(b) $12x^2 - x + 35$ (d) $-21x + 35$

17. $(x + 7)^2$

17. _____

(a) $x^2 + 49$ (b) $x^2 + 7x + 49$ (c) $x^2 - 14x + 49$ (d) $x^2 + 14x + 49$

18. $(x + 5)(2x^2 - 6x + 3)$

18. _____

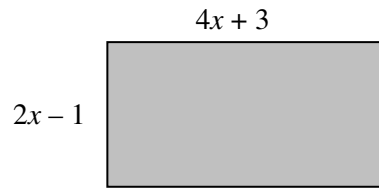(a) $2x^2 - 5x + 8$ (c) $2x^3 - 6x^2 + 3x + 15$

(b) $2x^2 - 6x + 15$ (d) $2x^3 + 4x^2 - 27x + 15$

19. Write an expression for the area of the figure shown.   19. _____

$$4x + 3$$

$2x - 1$

(a) $8x^2 + 2x - 3$ (c) $6x^2 + 2x + 2$

(b) $8x^2 + 10x - 3$ (d) $6x^2 + 10x + 2$

For Exercises 20–25, simplify.

20. $\dfrac{6^3 x}{6^2 x^4}$ 20. _____

(a) $\dfrac{6}{x^3}$ (b) $6x^3$ (c) $\dfrac{1}{6x^3}$ (d) $\dfrac{x^3}{6}$

21. $\dfrac{-5a^{-4}}{a^{-2}}$ 21. _____

(a) $\dfrac{1}{5a^2}$ (b) $-5a^2$ (c) $-\dfrac{5}{a^2}$ (d) $-\dfrac{a^2}{5}$

22. $\dfrac{-6x^{-5}y^4z^{-2}}{2x^2y^{-1}z^3}$ 22. _____

(a) $\dfrac{4y^5}{x^{10}z^6}$ (b) $\dfrac{4y^5}{x^7z^6}$ (c) $\dfrac{-3y^5}{c^{10}x^6}$ (d) $\dfrac{-3y^5}{x^7z^5}$

23. $\dfrac{4y^2 - 12y + 10}{4y}$ 23. _____

(a) $y - 3 + \dfrac{5}{2}$ (b) $4y^2 - 3 + \dfrac{5}{2y}$ (c) $y - 3 + \dfrac{5}{2y}$ (d) $y - 3 - \dfrac{5}{2y}$

24. $\dfrac{5a^3 + 18a^2 + 8a - 3}{a + 3}$ 24. _____

(a) $5a^2 + 3a - 1$ (c) $5a^2 - 3a + 1$

(b) $5a^2 - 3a - 1$ (d) $5a^2 + 3a + 1$

25. $\dfrac{4y^4 - 9y^2 + 2y - 3}{2y - 3}$

25. _____

(a) $2y^3 - 3y^2 + 1$

(c) $2y^3 - 3y^2 - 1$

(b) $2y^3 + 3y^2 - 1$

(d) $2y^3 + 3y^2 + 1$

1. List all possible factors of 40.

1. _____

2. Find the GCF of $72y^5$ and $16y^3$.

2. _____

For Exercises 3–18, factor completely.

3. $7y - 14$

3. _____

4. $8x^2y^3 - 16\,xy^4$

4. _____

5. $18x^2 + 12xy - 3xy - 2y^2$

5. _____

6. $x^2 - 4x - 45$

6. _____

7. $x^2 - 10x + 25$

7. _____

8. $9x^2 + 30x + 25$

8. _____

9. $2x^2 + 13x + 20$

9. _____

10. $12x^2 - 5x - 2$

10. _____

11. $15a^2 - 6a - 21$

11. _____

12. $8x^3 + 36x^2 - 20x$

12. _____

13. $x^2 - 81$

13. _____

14. $x^2 + 9$

14. _____

15. $4 - 16x^2$

15. _____

16. $-2x^2 + 18$

16. _____

17. $x^3 - 8$

17. _____

18. $64x^3 + 1$

18. _____

For Exercises 19–21, solve.

19. $x(x - 4) = 0$

19. _____

20. $y^2 - 13y = -30$

20. _____

21. $6x^2 + 13x = 28$ 21. _____

22. The width of a rectangle is 4 feet less than the length.   22. _____
     If the area is 32 square feet, find the width.

23. The product of two positive integers is 90. Find the   23. _____
     two integers if the larger is three more than twice the
     smaller.

For Exercises 24 and 25, graph.

24. $y = x^2 - 4$ 24.

25. $f(x) = x^2 - 6x + 5$ 25.

1. List all possible factors of 48.

1. _____

2. Find the GCF of $12x^5y$ and $56x^2y^3$.

2. _____

For Exercises 3–18, factor completely.

3. $9y - 42$

3. _____

4. $3x^4y - 12\,x^5y^3$

4. _____

5. $6x^2 - 9x - 4xy + 6y$

5. _____

6. $x^2 - 13x + 36$

6. _____

7. $x^2 - 100$

7. _____

8. $4x^2 - 20x + 25$

8. _____

9. $2a^2 - 7a + 3$

9. _____

10. $12x^2 - xy - y^2$

10. _____

11. $3x^2 - 15x - 42$

11. _____

12. $3a^2b - 11ab + 6b$

12. _____

13. $x^2 - 81$

13. _____

14. $x^2 + 16$

14. _____

15. $4a - 36a^3$

15. _____

16. $-12x^2 + 48$

16. _____

17. $x^3 + 27$

17. _____

18. $8x^3 - 125$

18. _____

For Exercises 19–21, solve.

19. $3x(x - 5) = 0$

19. _____

20. $y^2 - 4y = 45$

20. _____

21. $3x^2 + 13x = 10$ 21. _____

22. The width of a rectangle is 13 feet less than the   22. _____
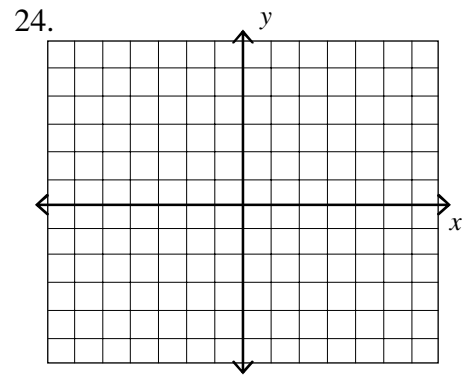   length. If the area is 30 square feet, find the width.

23. The product of two consecutive positive even   23. _____
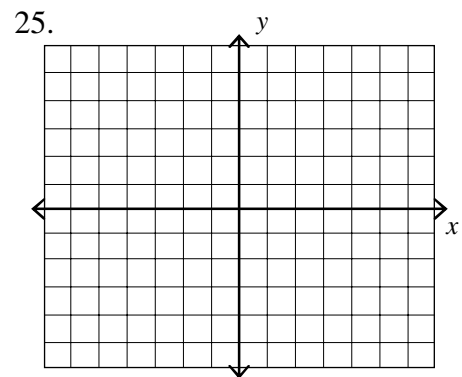   integers is 624. Find the numbers.

For Exercises 24 and 25, graph.

24. $y = x^2 - 9$ 24.

25. $f(x) = -x^2 + 2x + 3$ 25.

Chapter 6, Form C

1. List all possible factors of 72.   1. _____

2. Find the GCF of $16a^4b^3$ and $56ab^2$.   2. _____

For Exercises 3–18, factor completely.

3. $14y^2 - 42$ 3. _____

4. $15x^3y^2 - 30\,xy^3$ 4. _____

5. $3x^2 - 6xy - x + 2y$ 5. _____

6. $x^2 - 12x + 35$ 6. _____

7. $a^2 - 14a + 49$ 7. _____

8. $4x^2 - 12x + 9$ 8. _____

9. $2x^2 + 3x - 5$ 9. _____

10. $8x^2 + 6x - 9$ 10. _____

11. $5x^2 - 5x - 30$ 11. _____

12. $2x^2 - 10xy - 28y^2$ 12. _____

13. $x^2 + 36$ 13. _____

14. $81 - x^2$ 14. _____

15. $75 - 3a^2$ 15. _____

16. $-2x^2 + 50$ 16. _____

17. $125x^3 + y^3$ 17. _____

18. $27x^3 - 8$ 18. _____

For Exercises 19–21, solve.

19. $(x + 5)(x - 3) = 0$ 19. _____

20. $y^2 - 12y = -35$ 20. _____

21. $3x^2 + 19x = 14$ 21. _____

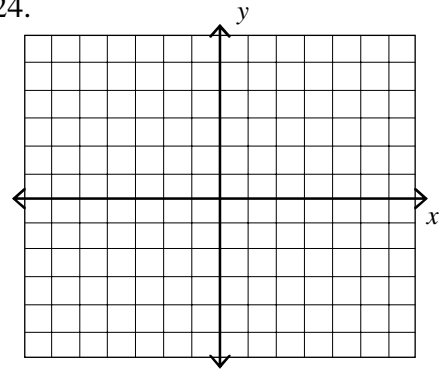22. The sum of the squares of three consecutive integers   22. _____
     is 50. Find the middle integer.

23. The length of a rectangular area is 16 feet less than   23. _____
     three times its width. If the area is 35 square feet,
     find the width.
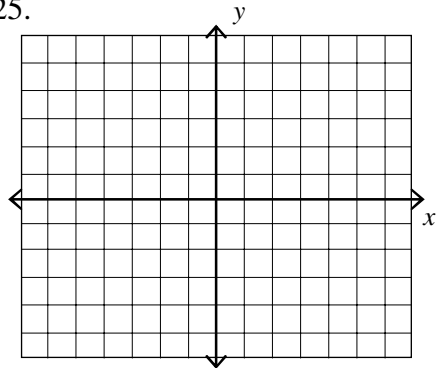
For Exercises 24 and 25, graph.

24. $y = 4 - x^2$ 24.

25. $f(x) = x^2 - x - 6$ 25.

Chapter 6, Form D

1. List all possible factors of 96.

1. _____

2. Find the GCF of $12x^5y^3z^2$ and $42x^2y^3z^5$.

2. _____

For Exercises 3–18, factor completely.

3. $-10x^4yz^2 - 25x^2z^3$

3. _____

4. $15x^3y^4 - 20\,x^2y^3 + 50\,x^3y^6$

4. _____

5. $8a^2 + 4a - 14ab - 7b$

5. _____

6. $ax^4 - 13ax^3 + 12ax^2$

6. _____

7. $49x^2 + 84x + 36$

7. _____

8. $81x^2 - 72x + 16$

8. _____

9. $6a^2 - 29a + 9$

9. _____

10. $9x^2 - 27xy + 20y^2$

10. _____

11. $12x^2 + 32\,x + 21$

11. _____

12. $12x^2y^2 - 19xy^2 + 5y^2$

12. _____

13. $25x^2 + 36y^2$

13. _____

14. $x^4 - 81$

14. _____

15. $50a^2 - 128a^4$

15. _____

16. $-3x^3 + 75xy^2$

16. _____

17. $64x^3y - y$

17. _____

18. $x^6 + 125$

18. _____

For Exercises 19–21, solve.

19. $x^3 - 36x = 0$

19. _____

20. $15y^2 - 18y = 24$

20. _____

21. $25x^3 - 15x^2 = 18x$

21. _____

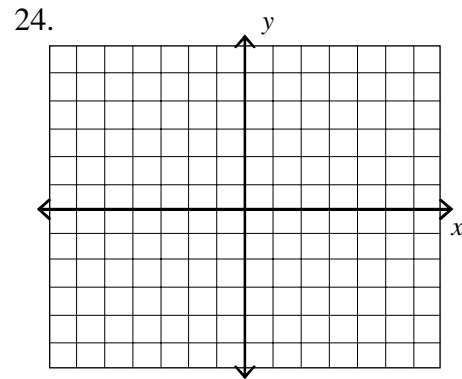22. Find two consecutive negative integers whose product is 182.

22. _____

23. A right triangle has a hypotenuse with a measure of 20 cm. Find the lengths of the legs if one leg is 4 cm longer than the other leg.
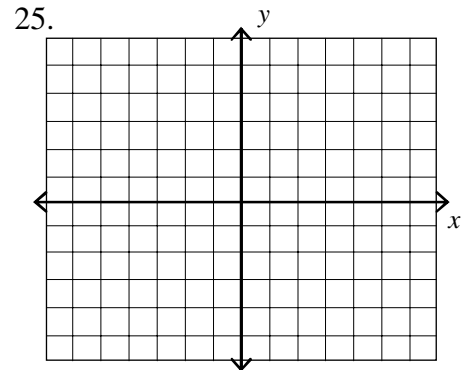
23. _____

For Exercises 24 and 25, graph.

24. $y = x^2 - 4x$

24.

25. $f(x) = 3x^2 - 2x - 5$

25.

1. List all possible factors of 36.   1. _____

    (a) $2^2 \cdot 3^2$ (c) 2, 4, 6, 9, 8, 36

    (b) $2 \cdot 2 \cdot 3 \cdot 3$ (d) 1, 2, 3, 4, 6, 9, 12, 18, 36

2. Find the GCF of $5a^2$, $25a^3$, and $20a^5$.   2. _____

    (a) 5   (b) a^2 (c) $5a^2$ (d) $25a^3$

For Exercises 3–18, factor completely.

3. $8y^2 - 4y$ 3. _____

    (a) $2y(4y - 2)$ (c) $8y(y - 4)$

    (b) $4y(2y - 1)$ (d) $4(2y^2 + y)$

4. $12a^5b - 6a^4b^2 + 3a^3b^3$ 4. _____

    (a) $3ab(4a^4 - 2a^3b + a^2b^2)$ (c) $3a^3b(2a - b)^2$

    (b) $3a^3b(4a^2 - 2ab + b^2)$ (d) $3a^3b(9a^2 - 6ab + b^{2)}$

5. $3y^2 - 21y + 4y - 28$ 5. _____

    (a) $(3y - 7)(y - 4)$ (c) $(3y + 4)(y - 7)$

    (b) $(3y - 7)(y + 4)$ (d) $(3y + 4)(y - 7)^2$

6. $x^2 - 15x + 36$ 6. _____

    (a) $(x - 4)(x - 9)$ (c) $(x - 3)(x - 12)$

    (b) $(x - 2)(x - 18)$ (d) $(x + 3)(x - 12)$

7. $4a^4 - 4a^2 + 1$ 7. _____

    (a) $(2a - 1)^4$ (c) $4a^2(a^2 - 1)$

    (b) $(2a^2 - 1)^2$ (d) $(2a^2 + 1)^2$

8. $16a^2 - 40ab + 25b^2$ 8. _____

   (a) Prime   (c) $(4a + 5b)(4a - 5b)$

   (b) $(4a - 5b)^2$ (d) $(4a + 5b)^2$

9. $3x^2 - x - 14$ 9. _____

   (a) $(x - 7)(x + 2)$ (c) $(x - 2)(3x + 7)$

   (b) $(x + 7)(x - 2)$ (d) $(3x - 7)(x + 2)$

10. $6x^2 - 7x - 5$ 10. _____

   (a) $(6x - 5)(x + 1)$ (c) $(x - 5)(6x + 1)$

   (b) $(3x + 5)(2x - 1)$ (d) $(3x - 5)(2x + 1)$

11. $18a^2 + 33a + 15$ 11. _____

   (a) $(6a + 5)(3a + 3)$ (c) $3(6a + 5)(a + 1)$

   (b) $(18a + 15)(a + 1)$ (d) $3(6a - 5)(a - 1)$

12. $-3x^3 - 6x^2 + 12x$ 12. _____

   (a) $3x(x^2 - 2x + 4)$ (c) $-3x(x^2 - 2x - 4)$

   (b) $-x(3x + 4)(x + 3)$ (d) $-3x(x^2 + 2x - 4)$

13. $4y^2 - 9$ 13. _____

   (a) $(2y + 9)(2y - 1)$ (c) $(2y + 3)(2y - 3)$

   (b) $(2y - 1)(2y - 9)$ (d) $(4y + 1)(y - 9)$

14. $a^2 + 2ab - 8b^2$ 14. _____

   (a) $(a - 8b)(a + b)$ (c) $(a + 4b)(a - 2b)$

   (b) $(a - 6b)(a + 2b)$ (d) $(a - 4b)(a + 2b)$

15. $1 - 64x^2$ 15. _____

   (a) $(1 - 8x)(1 - 8x)$ (c) $(1 + 8x)(1 + 8x)$

   (b) $(1 - 8x)(1 + 8x)$ (d) $(1 - 8x)(1 + x)$

16. $4x^2 - 400\,y^2$ 16. _____

    (a) $4(x^2 - 100\,y^2)$ (c) $(2x + 20y)(2x - 20y)$

    (b) $(2x + 20y)(2x + 20y)$ (d) $4(x + 10y)(x - 10y)$

17. $8x^3 + 27$ 17. _____

    (a) $(2x + 3)^3$ (c) $(2x + 3)(4x^2 - 6x + 9)$

    (b) $(2x + 3)(4x^2 + 6x + 9)$ (d) $(2x + 3)(4x^2 - 12x + 9)$

18. $x^3 - 8y^3$ 18. _____

    (a) $(x - 2y)^3$ (c) $(x - 2y)(x^2 - 2xy + 4y^2)$

    (b) $(x - 2y)(x^2 + 4xy + 4y^2)$ (d) $(x - 2y)(x^2 + 2xy + 4y^2)$

For Exercises 19–21, solve.

19. $x(x - 11) = 0$ 19. _____

    (a) -11 (b) 11 (c) $0, -11$ (d) $0, 11$

20. $y^2 + 5y = 36$ 20. _____

    (a) $-9, 4$ (b) $-6, 6$ (c) $-4, 9$ (d) $-3, 12$

21. $4x^2 - 37x = 30$ 21. _____

    (a) $-10, \dfrac{3}{4}$ (b) $-6, \dfrac{5}{4}$ (c) $-\dfrac{5}{4}, 6$ (d) $-\dfrac{3}{4}, 10$

22. The width of a rectangle is 2 feet longer than three times   22. _____
     the length. If the area is 120 square feet, find the length.

    (a) 5 feet   (b) 6 feet   (c) 7 feet   (d) 9 feet

23. The product of two consecutive odd natural numbers is   23. _____
     323. Find the integers.

    (a) 11 and 32 (b) 13 and 23 (c) 17 and 19 (d) 19 and 21

24.   The graph of which equation is shown below?   24. _____

(a) $y = -\dfrac{1}{2}x^2$ (c) $y = -2x^2$
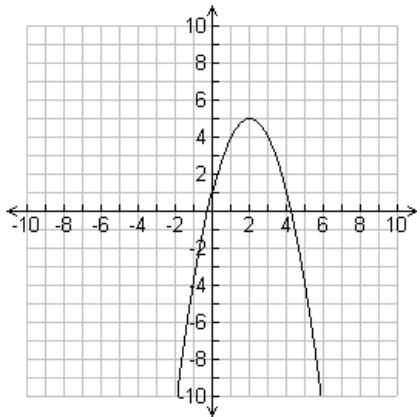
(b) $y = \dfrac{1}{2}x^2$ (d) $y = 2x^2$

25.   The graph of which equation is shown below?   25. _____

(a) $y = -x^2 - 4x + 1$ (c) $y = x^2 - 4x + 1$

(b) $y = -x^2 + 4x + 1$ (d) $y = x^2 + 4x + 1$

For Exercises 1 and 2, find the value(s) that can replace the variable in the expression and cause the expression to be undefined.

1. $\dfrac{2x}{x-4}$

1. _____

2. $\dfrac{3+x}{x^2-25}$

2. _____

For Exercises 3 and 4, simplify to lowest terms.

3. $\dfrac{7x-x^2}{x^2-14x+49}$

3. _____

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

4. _____

For Exercises 5 and 6, find the least common denominator and write equivalent rational expressions with the LCD.

5. $\dfrac{4}{x^6 y^3},\dfrac{2}{x^2 y^5}$

5. _____

6. $\dfrac{2x}{x^2-10x+25},\dfrac{3}{x^2-25}$

6. _____

For Exercises 7–18, perform the indicated operation.

7. $\dfrac{3mn}{5x^2 y^2}\cdot\dfrac{15x^3 y^3}{6m^2 n}$

7. _____

8. $\dfrac{28x^4 y^2}{5a^3 b^2}\div\dfrac{7x^2 y}{20a^2 b^5}$

8. _____

9. $\dfrac{6x-xy}{a^3}\div\dfrac{xy-6x}{a^2}$

9. _____

10. $\dfrac{10x^2 - 5x}{2x^2 + 9x - 5} \cdot \dfrac{x^2 - 25}{5x}$

10. _____

11. $\dfrac{3x}{3x+5} + \dfrac{6x}{3x+5}$

11. _____

12. $\dfrac{a}{a^2 - 25} - \dfrac{5}{a^2 - 25}$

12. _____

13. $\dfrac{3}{x^2 - 4} + \dfrac{x+1}{x^2 + 2x}$

13. _____

14. $\dfrac{4}{x-2} + \dfrac{3}{x+3}$

14. _____

15. $\dfrac{7}{x+7} - \dfrac{5}{x-5}$

15. _____

16. $\dfrac{a}{4a+32} - \dfrac{16}{a^2 + 8a}$

16. _____

17. $\dfrac{5 + \dfrac{1}{a}}{3 - \dfrac{1}{a}}$

17. _____

18. $\dfrac{\dfrac{a^2 - 64}{15}}{\dfrac{a+8}{5}}$

18. _____

For Exercises 19–22, solve the equation.

19. $\dfrac{1}{y} + \dfrac{1}{2} = -\dfrac{1}{3}$

19. _____

20. $\dfrac{2}{x+1} - \dfrac{1}{6} = \dfrac{1}{x}$

20. _____

21. $\dfrac{1}{a} + \dfrac{1}{a-3} - \dfrac{a-2}{a-3} = 0$

21. _____

22. $\dfrac{8}{y^2 + y - 6} = \dfrac{6}{y^2 - 9}$

22.   _____

For Exercises 23–25, solve.

23.   Jim can complete a job in 60 minutes, but it takes
his friend only 30 minutes to complete the same
job. How long will it take them to complete the job
if they work together?

23.   _____

24.   A jet can fly 550 mph in calm air. Traveling with
the wind, the jet can fly 2400 miles in the same
amount of time it takes to fly 2000 miles against the
wind. Find the rate of the wind.

24.   _____

25.   The volume of a gas is inversely proportional to the
pressure on the gas. If the volume is 6 cubic
centimeters when the pressure on the gas is
8 kilograms per square centimeter, then what is the
volume when the pressure is 12 kilograms per
square centimeters?

25.   _____

For Exercises 1 and 2, find the value(s) that can replace the variable in the expression and cause the expression to be undefined.

1. $\dfrac{6x}{x+6}$

1. _____

2. $\dfrac{3+x}{x^2-16}$

2. _____

For Exercises 3 and 4, simplify to lowest terms.

3. $\dfrac{5x-x^2}{x^2-10x+25}$

3. _____

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

4. _____

For Exercises 5 and 6, find the least common denominator and write equivalent rational expressions with the LCD.

5. $\dfrac{3}{a^4b^3},\dfrac{6}{a^2b^5}$

5. _____

6. $\dfrac{3x}{x^2-6x+9},\dfrac{4}{x^2-9}$

6. _____

For Exercises 7–18, perform the indicated operation.

7. $\dfrac{4m^3n}{15a^2b^2}\cdot\dfrac{45a^3b^3}{8m^2n}$

7. _____

8. $\dfrac{10x^4y^2}{3m^3n^2}\div\dfrac{5x^2y^3}{12m^2n^5}$

8. _____

9. $\dfrac{4xy-8x}{b^5}\div\dfrac{2x-xy}{b^2}$

9. _____

10. $\dfrac{8x^2 - 4x}{2x^2 + 3x - 2} \cdot \dfrac{x^2 - 4}{4x}$

10. _____

11. $\dfrac{2x}{4x + 7} + \dfrac{8x}{4x + 7}$

11. _____

12. $\dfrac{a}{a^2 - 16} - \dfrac{4}{a^2 - 16}$

12. _____

13. $\dfrac{5}{x^2 - 49} + \dfrac{2x + 1}{x^2 + 7x}$

13. _____

14. $\dfrac{5}{x - 6} + \dfrac{3}{x + 2}$

14. _____

15. $\dfrac{5}{x - 5} - \dfrac{8}{x + 8}$

15. _____

16. $\dfrac{x}{3x + 6} - \dfrac{2}{x^2 + 2x}$

16. _____

17. $\dfrac{7 - \dfrac{1}{2a}}{5 + \dfrac{1}{2a}}$

17. _____

18. $\dfrac{\dfrac{b^2 - 81}{6}}{\dfrac{b + 9}{3}}$

18. _____

For Exercises 19–22, solve the equation.

19. $\dfrac{y}{4} - \dfrac{y}{6} = \dfrac{1}{4}$

19. _____

20. $\dfrac{3}{2y - 2} - \dfrac{2}{y - 1} = -\dfrac{1}{2}$

20. _____

21. $\dfrac{2}{x - 2} + \dfrac{x}{x + 2} = \dfrac{x + 6}{x^2 - 4}$

21. _____

22. $\dfrac{y}{y-1} = \dfrac{6}{y+1}$

22. _____

For Exercises 23–25, solve.

23. Bill can build a bookcase in 6 hours, but it takes his friend, David, only 4 hours to build the same bookcase. How long will it take them to build the bookcase if they work together?

23. _____

24. A bus can travel 80 miles in the same time that a train travels 96 miles. The speed of the train is 10 miles per hour faster than the speed of the bus. Find the speed of the train.

24. _____

25. The electric current I, in amperes, in a circuit varies directly as the voltage V. When 12 volts are applied, the current is 4 amperes. What is the current when 18 volts are applied?

25. _____

For Exercises 1 and 2, find the value(s) that can replace the variable in the expression and cause the expression to be undefined.

1. $\dfrac{4x}{x+8}$

1. _____

2. $\dfrac{9+3x}{x^2-9}$

2. _____

For Exercises 3 and 4, simplify to lowest terms.

3. $\dfrac{4y-y^2}{y^2-2y-8}$

3. _____

4. $\dfrac{2x^2-8x}{x^2-8x+16}$

4. _____

For Exercises 5 and 6, find the least common denominator and write equivalent rational expressions with the LCD.

5. $\dfrac{5x}{x^5y^2},\dfrac{3y}{x^4y^3}$

5. _____

6. $\dfrac{5y}{y^2-10y+25},\dfrac{2}{y^2-25}$

6. _____

For Exercises 7–18, perform the indicated operation.

7. $\dfrac{8x^3y^2}{3a^3b^2}\cdot\dfrac{9a^3b^3}{4x^2y^4}$

7. _____

8. $\dfrac{21x^5y^2}{2a^3b^2}\div\dfrac{7x^2y^3}{12a^3b^5}$

8. _____

9. $\dfrac{3y^2-6y}{b^5}\div\dfrac{2y^2-4y}{b^3}$

9. _____

10. $\dfrac{10x^2 - 5x}{5x + 25} \cdot \dfrac{x^2 - 25}{5x}$

10. _____

11. $\dfrac{-5x}{7x + 5} + \dfrac{7x}{7x + 5}$

11. _____

12. $\dfrac{2a}{4a^2 - 9} - \dfrac{3}{4a^2 - 9}$

12. _____

13. $\dfrac{3}{x^2 - 16} + \dfrac{x - 1}{x^2 + 4x}$

13. _____

14. $\dfrac{5}{x - 5} + \dfrac{2}{x + 2}$

14. _____

15. $\dfrac{5}{x - 3} - \dfrac{2}{x - 4}$

15. _____

16. $\dfrac{x}{5x + 35} - \dfrac{7}{x^2 + 7x}$

16. _____

17. $\dfrac{4 - \dfrac{1}{3x}}{2 + \dfrac{1}{3x}}$

17. _____

18. $\dfrac{\dfrac{b^2 - 6b + 9}{3}}{\dfrac{b - 3}{6}}$

18. _____

For Exercises 19–22, solve the equation.

19. $\dfrac{y}{5} = \dfrac{y}{2} - \dfrac{1}{2}$

19. _____

20. $\dfrac{4}{2x + 1} = \dfrac{2}{3x - 2}$

20. _____

21. $\dfrac{1}{x - 2} + \dfrac{1}{2x - 4} - \dfrac{3}{2} = 0$

21. _____

22. $\dfrac{3}{x+2} = \dfrac{8}{x^2-4} - \dfrac{2}{x-2}$

22. _____

For Exercises 23–25, solve.

23. Mark can complete a job in 12 hours, but it takes his friend only 9 hours to complete the same job. How long will it take them to complete the job if they work together?

23. _____

24. Pat has a boat that travels 24 mph in still water. He goes 50 miles downstream in the same times it takes him to go 30 miles upstream. What is the rate of the current?

24. _____

25. The weight of an object is directly proportional to its mass. A person who weighs 161 pounds has a mass of 5 slugs. Find the weight of a person that with a mass of 3.5 slugs.

25. _____

Chapter 7, Form D

For Exercises 1 and 2, find the value(s) that can replace the variable in the expression and cause the expression to be undefined.

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

1. _____

2. $\dfrac{2x+4}{x^2+4}$

2. _____

For Exercises 3 and 4, simplify to lowest terms.

3. $\dfrac{6y-y^2}{y^2-12y+36}$

3. _____

4. $\dfrac{2y^2-18y}{4y^3-32y^2-36y}$

4. _____

For Exercises 5 and 6, find the least common denominator and write equivalent rational expressions with the LCD.

5. $\dfrac{3}{4x^3y^5},\dfrac{5}{6x^5y^2}$

5. _____

6. $\dfrac{5y}{y^2+5y-6},\dfrac{2}{y^2-36}$

6. _____

For Exercises 7–18, perform the indicated operation.

7. $\dfrac{25a^3b^2}{11a^4b}\cdot\dfrac{22ab^2}{15a^2b}$

7. _____

8. $\dfrac{20a^2b}{30a^3b^2}\div\dfrac{4a^4b^2}{8a^2b}$

8. _____

9. $\dfrac{12y-9x}{y+x}\div\dfrac{3x-4y}{x+y}$

9. _____

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10. $\dfrac{2x^2 + 5xy + 2y^2}{4y^2 - x^2} \cdot \dfrac{2y^2 + xy - x^2}{y^2 + yx - 2x^2}$

10. _____

11. $\dfrac{4x^2}{2x + y} - \dfrac{y^2}{2x + y}$

11. _____

12. $\dfrac{3}{a^2 - 9} - \dfrac{2}{9 - a^2}$

12. _____

13. $\dfrac{x}{x + 1} - \dfrac{3x - 5}{x^2 + 6x + 5}$

13. _____

14. $\dfrac{3}{x - 6} + \dfrac{2}{x + 6}$

14. _____

15. $\dfrac{x + 2}{5x + 20} - \dfrac{2}{x^2 + 4x}$

15. _____

16. $\dfrac{y^2 - 2}{2y^2 - y - 3} + \dfrac{y - 2}{3 - 2y}$

16. _____

17. $\dfrac{\dfrac{2}{x} + 1}{1 - \dfrac{2}{x}}$

17. _____

18. $\dfrac{\dfrac{2}{x} + \dfrac{3}{y}}{\dfrac{4y^2 - 9x^2}{2x}}$

18. _____

For Exercises 19–22, solve the equation.

19. $\dfrac{3}{y} + \dfrac{1}{4} = \dfrac{5}{8}$

19. _____

20. $\dfrac{x}{2x - 4} + 1 = \dfrac{1}{x - 2}$

20. _____

21. $\dfrac{2a}{a - 4} + \dfrac{4}{a + 4} + \dfrac{2}{a^2 - 16} = 0$

21. _____

22. $\dfrac{x+17}{x^2-1} = \dfrac{x-2}{x-1} + \dfrac{1}{x+1}$

22. _____

For Exercises 23–25, solve.

23. One pipe can fill a hot tub in 20 minutes and a second pipe can fill it in 30 minutes. If the hot tub is empty, how long will it take both pipes to fill the tub?

23. _____

24. A boat that can travel 8 mph in still water can travel 15 miles with the water's current in the same time that it can travel 9 miles against the water's current. What is the rate of the water's current?

24. _____

25. An electric bill varies directly as the amount of electricity used. A bill for 1400 kilowatts of electricity is $98. What is the bill for 4400 kilowatts of electricity?

25. _____

For Exercises 1 and 2, find the value(s) that can replace the variable in the expression and cause the expression to be undefined

1. $\dfrac{5}{x-3}$

   1. _____

   (a) –5   (b) –3   (c) 3   (d) 5

2. $\dfrac{3a}{a^2-16}$

   2. _____

   (a) –4 and 4   (b) –3   (c) 0   (d) 4

For Exercises 3 and 4, simplify to lowest terms.

3. $\dfrac{x-5}{x^2-8x+15}$

   3. _____

   (a) $\dfrac{1}{x-5}$ (b) $\dfrac{1}{x-3}$ (c) $\dfrac{1}{x+5}$ (d) $\dfrac{1}{x+3}$

4. $\dfrac{8-4y}{y^2-2y}$

   4. _____

   (a) $-\dfrac{4}{y}$ (b) $\dfrac{2}{y}$ (c) $\dfrac{y+2}{y-2}$ (d) $-\dfrac{4}{y-2}$

5. Determine the least common denominator of $\dfrac{5}{6x^2y}$ and $\dfrac{-7}{4xy^3}$

   5. _____

   (a) $6xy$ (b) $12x^2y^3$ (c) $6x^2y^3$ (d) $24x^2y^3$

6. Determine the least common denominator for $\dfrac{y}{2x}$ and y. Then write

   6. _____

   these expressions as equivalent expressions with the least common denominator as the denominator.

   (a) $\dfrac{y}{2x}$ and $\dfrac{2xy}{2x}$ (c) $\dfrac{y^2}{2xy}$ and $\dfrac{2xy^2}{2xy}$

   (b) $\dfrac{y^2}{2x}$ and $\dfrac{2xy^2}{2x}$ (d) $\dfrac{y}{2x}$ and $\dfrac{y}{2x}$

For Exercises 7–18, perform the indicated operation.

7. $\dfrac{4a^2b}{3ab^3} \cdot \dfrac{9ab^2}{8a^2b^3}$

7. _____

    (a) $\dfrac{3}{2b^3}$ (b) $\dfrac{3a}{2b^6}$ (c) $\dfrac{10}{3b^4}$ (d) $\dfrac{5}{3b^3}$

8. $\dfrac{-7x^4}{5y^6} \div \dfrac{49x}{10y^7}$

8. _____

    (a) $-\dfrac{7x^3}{2y}$ (b) $-\dfrac{2x^3y}{7}$ (c) $\dfrac{7x^3}{2y}$ (d) $\dfrac{2x^3y}{7}$

9. $\dfrac{2x^2 - x - 1}{x^2 - x} \div \dfrac{2x+1}{x}$

9. _____

    (a) $\dfrac{1}{3}$ (b) 1 (c) x (d) $\dfrac{x}{2x+1}$

10. $\dfrac{y^2 + 13y + 42}{11y - 22} \div \dfrac{y^2 - 49}{5y - 10}$

10. _____

    (a) $\dfrac{5}{11}$ (b) $\dfrac{5(y-6)}{11(y+7)}$ (c) $\dfrac{5(y+6)}{11(y-7)}$ (d) $\dfrac{y+6}{y-7}$

11. $\dfrac{6a+2}{4b} + \dfrac{3a+2}{4b}$

11. _____

    (a) $\dfrac{9a}{8b}$ (b) $\dfrac{9a+4}{8b}$ (c) $\dfrac{9a+2}{2b}$ (d) $\dfrac{9a+4}{4b}$

12. $\dfrac{y}{y^2 - 2y - 24} + \dfrac{4}{y^2 - 2y - 24}$

12. _____

    (a) $\dfrac{1}{y-6}$ (c) $\dfrac{4}{(y-6)(y+4)}$

    (b) $\dfrac{4y}{(y-6)(y+4)}$ (d) $y-6$

13. $\dfrac{6a}{2a-b} - \dfrac{3b}{2a-b}$

13. _____

    (a) $\dfrac{6a-3b}{2a-b}$ (b) $\dfrac{6a+3b}{2a-b}$ (c) $\dfrac{3a-3b}{a-b}$ (d) 3

14. $\dfrac{5}{a+2}+\dfrac{3}{a-1}$ 14. _____

(a) $\dfrac{8a+1}{(a+2)(a-1)}$ (b) $\dfrac{8a+5}{(a+2)(a-1)}$ (c) $\dfrac{8}{(a+2)(a-1)}$ (d) $\dfrac{8a-3}{(a+2)(a-1)}$

15. $\dfrac{5}{b+6}-\dfrac{4}{b-3}$ 15. _____

(a) $\dfrac{1}{(b+6)(b-3)}$ (c) $\dfrac{b+9}{(b+6)(b-3)}$

(b) $\dfrac{9}{(b+6)(b-3)}$ (d) $\dfrac{b-39}{(b+6)(b-3)}$

16. $\dfrac{3y}{y^2-4}-\dfrac{3}{2-y}$ 16. _____

(a) $\dfrac{-6}{y+2}$ (b) $\dfrac{6}{4-y^2}$ (c) $\dfrac{3y+3}{(y^2-4)(2-y)}$ (d) $\dfrac{6y+6}{(y-2)(y+2)}$

17. $\dfrac{2-\dfrac{4}{y+6}}{3-\dfrac{6}{y+6}}$ 17. _____

(a) $\dfrac{2}{3}$ (b) $\dfrac{2(y+1)}{3y}$ (c) $\dfrac{2(y+4)}{3y}$ (d) $\dfrac{2(y+8)}{3y}$

18. $\dfrac{\dfrac{3}{a}-\dfrac{3}{a-3}}{\dfrac{5}{a}+\dfrac{1}{a-3}}$ 18. _____

(a) $\dfrac{-3}{2a-5}$ (b) $\dfrac{-9}{2a-5}$ (c) $\dfrac{2a-3}{2a-5}$ (d) $\dfrac{6a-9}{6a-15}$

For Exercises 19–22, solve the equation.

19. $\dfrac{3}{x}-\dfrac{1}{3x}=\dfrac{1}{5}$ 19. _____

(a) $\dfrac{40}{3}$ (b) 10   (c) 8   (d) No solution

20. $\dfrac{x+2}{x+1} = \dfrac{x-3}{x+6}$ 20. _____

    (a) $-\dfrac{3}{2}$ (b) $\dfrac{3}{2}$ (c) –3, 2   (d) –2, 3

21. $\dfrac{2y+1}{y^2-4} - \dfrac{3}{y+2} = \dfrac{-4}{y-2}$ 21. _____

    (a) –1   (b) –2   (c) –5   (d) No solution

22. $\dfrac{y}{2y+1} = \dfrac{2}{4y-3}$ 22. _____

    (a) –2, $\dfrac{1}{4}$ (b) $-\dfrac{1}{2}, \dfrac{3}{4}$ (c) $-\dfrac{1}{4}, 2$ (d) $\dfrac{1}{2}, 2$

For Exercises 23–25, solve.

23. A pool can be filled with one pipe in 8 hours, whereas a second pipe   23. _____
    requires 20 hours to fill the pool. How long will it take to fill the pool with
    both pipes turned on?

    (a) $2\dfrac{1}{2}$ hours   (b) $5\dfrac{5}{7}$ hours   (c) 7 hours   (d) 14 hours

24. A jet can fly 550 mph in calm air. Traveling with the wind, the plane can   24. _____
    fly 2400 miles in the same amount of time it takes to fly 2000 miles
    against the wind. Find the rate of the wind.

    (a) 5 mph   (b) 25 mph   (c) 50 mph   (d) 150 mph

25. The demand for coffee at a concession stand varies inversely with the   25. _____
    temperature. If a vendor sold 9 gallons when the temperature was 30°,
    how many gallons would he sell if the temperature were 45°?

    (a) 5 gallons   (b) 6 gallons   (c) 7.5 gallons   (d) 12 gallons