

MATH 1314 College Algebra Prerequisite Review

Order of Operations

1. Evaluate each expression.

a) $5 + 3 \cdot 4$ b) $(5 - 2)^2 + 3 \cdot 5$ c) $4^3 \div 4^2 - 5(2 - 7) \div 5$

d) $[(2 - 3)^3 - 3^2] \cdot 3 - 4$ e) $\frac{3 \cdot (2 - 4)^2 + 2 \cdot 11}{3^2 - (-2)^2}$

2. Evaluate each expression for the given value of the variable(s).

a) $3x^3 - 5x^2 + 4x - 2$ for $x = -2$ b) $4x^2 - 6x - 4$ for $x = -\frac{1}{2}$

c) $(3x^2 - 1)(x - 1) + 5$ for $x = -2$ d) $\frac{3xy^3}{2x - y}$ for $x = -3$ and $y = -2$

Solving Linear Equations and Inequalities

3. Solve the following linear equations.

a) $0.25x + 1.2 = 1.55 - 1.2x$ b) $7x + 3 = 3x - 17$
c) $12(x + 4) = 3(-6x + 10)$ d) $2x - 5(x - 2) = 20 - (2x + 6)$
e) $5(x + 1) - 3(2x + 3) = 3(x + 2)$ f) $3(x - 1) + 9 = 8x + 6 - 5x$
g) $\frac{x}{x - 2} + \frac{2}{3} = \frac{2}{x - 2}$ h) $\frac{2}{3} \left(\frac{7}{8} - 4x \right) - \frac{5}{8} = \frac{3}{8}$

4. Solve the following linear inequalities.

a) $-x + 5 > 7$ b) $-5x > 7$ c) $3x - 2 \leq 7x + 4$ d) $15.2 - 3.1x \geq -4.7$
e) $-5(x - 2) + 1 < 2(x - 1) - 2$ f) $\frac{x}{5} + \frac{3}{7} \leq 2$ g) $\frac{3}{2} \left(\frac{5}{6} - 4x \right) - \frac{2}{3} \leq \frac{3}{12}$

Formulas

5. Solve the formula for the indicated letter.

a) Solve for m : $y = mx + b$ b) Solve for F : $C = \frac{5}{9}(F - 32)$
c) Solve for d : $F = \frac{c + 2d}{3}$ d) Solve for t : $A = P + Prt$
e) Solve for r : $A = P + Prt$ f) Solve for P : $A = P + Prt$
g) Solve for l : $P = 2l + 2w$

Lines and Linear Equations

6. Plot the following points and identify the quadrant in which they lie.

a) $(-2, 3)$

b) $(-4, -2)$

c) $(3, -2)$

7. Determine if the given ordered pair is a solution of the equation.

a) $(-2, -3)$ $y = 3x + 3$ b) $(-4, -2)$ $y = 3x + 3$ c) $(-2, 7)$ $y = x^2 + 3$

8. Find the x - and y -intercepts of the following linear equations.

a) $2x - 4y = 8$

b) $-x + 2y = 5$

c) $y = -\frac{1}{2}x + 2$

9. For each of the following, find the x -intercept and y -intercept and graph.

a) $2x - 4y = 6$

b) $-3x - 2y = 6$

c) $3x + 4y = 12$

10. Graphing the following horizontal and vertical lines.

a) $x = 3$

b) $y = -2$

11. Find the slope of the line through the given points.

a) $(7, -2)$ and $(3, -1)$

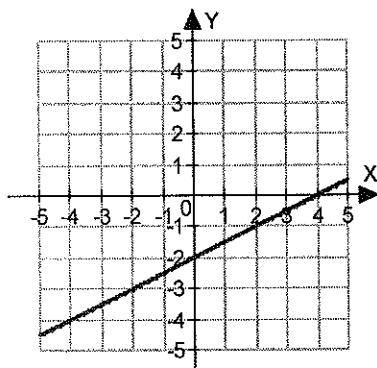
b) $(-2, -1)$ and $(-5, 5)$

c) $(5, -1)$ and $(5, -2)$

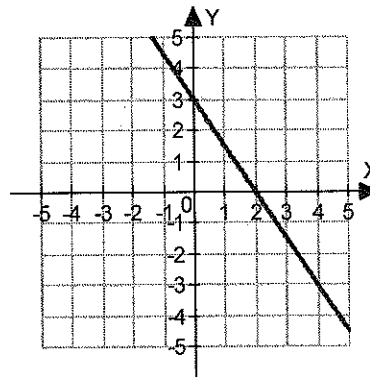
d) $(-2, -2)$ and $(-3, -2)$

12. Find the slope of a line given the graph.

a)



b)



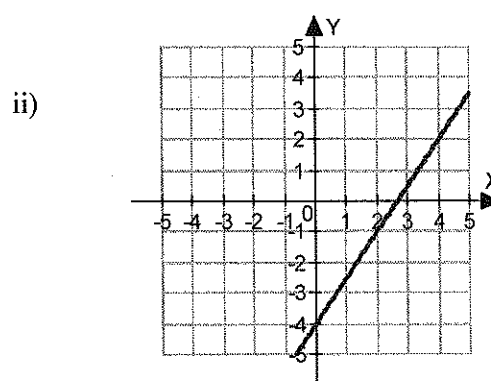
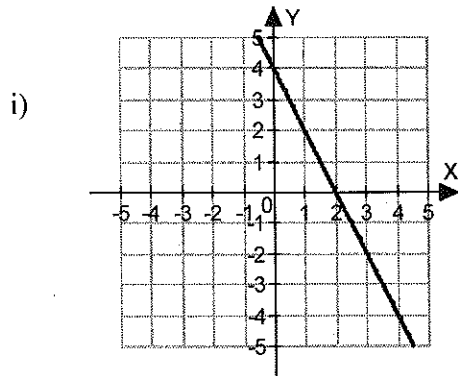
13. Use the slope-intercept form to answer the following.

a) Determine the slope and y -intercept of $2y - 6x = 6$.

b) Determine the slope and y -intercept of $-7y + 5x = -4$.

c) Give the slope-intercept equation for the line that passes through the point $(0, -2)$ with slope $m = -\frac{3}{4}$.

d) Find the slope-intercept equation for the line whose graph is given.



14. Graph the line from the given information.

- Graph the line with slope $\frac{2}{5}$ and y-intercept $(0, -2)$
- Determine the slope and y-intercept of $4y - 2x = 8$ and then graph.

15. Write an equation of the line from the given information.

- Write an equation for the line that passes through the points $(2, -5)$ and $(5, -2)$.
- Write an equation for the line that passes through the points $(-3, 4)$ and $(-2, -2)$.
- Write an equation for the line that passes through the points $(-1, 1)$ and $(-1, 7)$.
- Write an equation for the line that passes through the points $(-1, 4)$ and $(-4, 4)$.
- Write an equation of the line parallel to the line $-2x + 4y = 8$ and passing through $(-1, 1)$.
- Write an equation of the line perpendicular to the line $-4x - 6y = 8$ and passing through $(-1, 1)$.

Factoring

16. Factor out the GCF

- $8x^2 - 6x^3 + x$
- $6x^3 - 9x^2 + 12x$
- $3(x + y) - 5x(x + y)$
- $3x^2y(x + 3) - (x + 3)$

17. Factor by grouping

- $x^3 + 3x^2 + x + 3$
- $2x^3 - x^2 - 10x + 5$
- $4x^2 - 8xy - 3x + 6y$
- $xy - 2yz + 5x - 10z$
- $x^4 - 5x^3 + 2x^2 - 10x$

18. Factor the following trinomials of the form $x^2 + bx + c$.

- $x^2 + 4x + 3$
- $x^2 - 13x + 30$
- $x^3 - 3x^2 - 28x$
- $x^2 + 11xy + 28y^2$
- $3x^2 - 24x - 60$
- $5x^3y - 25x^2y^2 - 120xy^3$

19. Factor the following trinomials of the form $ax^2 + bx + c$.

a) $8x^2 - 14x + 5$

b) $3x^2 - x - 10$

c) $8x^2 + 33x + 4$

d) $2x^2 + 7x + 6$

e) $3x^2 + 20x + 12$

f) $12x^2 + 10xy - 8y^2$

20. Factor the following differences of two squares.

a) $x^2 - 16y^2$

c) $(x - y)^2 - 36$

b) $4x^2 - 36y^2$

21. Factor the following perfect square trinomials.

a) $x^2 + 16x + 64$

b) $4x^2 + 12x + 9$

c) $9x^2 - 12x + 4$

d) $4y^2 - 28xy + 49x^2$

22. Factor the following sums or differences of cubes

a) $x^3 - 8y^3$

b) $1 - 8y^3$

c) $27x^3 - y^3$

d) $x^3 + 125$

Solving Quadratic Equations

23. Solve the following quadratic equations.

a) $x^2 + 4x + 3 = 0$

c) $x(3x - 1) = 10$

e) $3x^2 + 20x + 12 = 0$

g) $4x^2 + 12x + 9 = 0$

i) $3x^2 + 2x - 8 = 0$

k) $x^2 + 6x - 2 = 0$

b) $x^3 - 3x^2 - 28x = 0$

d) $8x^2 + 33x + 4 = 0$

f) $x^2 + 16x + 64 = 0$

h) $9x^2 - 12x = -4$

j) $x^2 + 2x - 2 = 0$

l) $x^2 = 4x + 7$

Rational Expressions

24. Perform the indicated operation.

a) Simplify: $\frac{x^2 - 6x + 9}{x^2 - 9}$

c) $\frac{x^2 - 25}{x^2 - 3x - 10} \cdot \frac{x^2 + 7x + 10}{x^2 + 10x + 25}$

e) $\frac{2x}{x - 5} - \frac{10}{x - 5}$

b) Simplify: $\frac{4x^2 - 12x - 40}{2x^2 - 16x + 30}$

d) $\frac{2x^2 - 9x - 5}{x^2 + 2x - 35} \cdot \frac{2x^2 - 7x - 4}{x^2 + 3x - 28}$

f) $\frac{x}{x^2 + 2x - 15} - \frac{3}{x^2 + 2x - 15}$

Solving Systems of Equations

25. Use any method to solve each system of linear equations.

a) $y = x + 3$
 $y = -x + 5$

c) $2x + 3y = 4$
 $y = x - 5$

e) $2x - 5y = 4$
 $3x - 7y = 15$

b) $-3x + 2y = 11$
 $2x + 5y = -18$

d) $3x + 4y = 2$
 $2x + 5y = -1$

f) $x + 2y = 6$
 $3x + 6y = 6$

Applications (Word Problems)

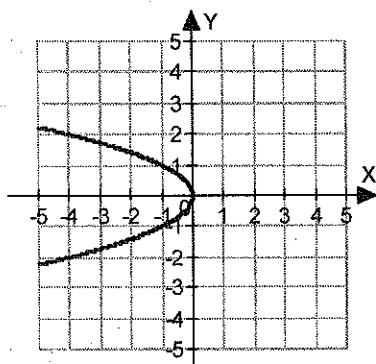
26. Your bill for lunch was \$26.45. This included a 15% tip. What was the cost of the meal without the tip?
27. After a 13% discount, a new DVD player was selling for \$217.50. What was the original price of the DVD player?
28. The second angle of a triangle is three times as large as the first. The third angle is 30° more than the measure of the first angle. What is the measure of each angle?
29. The number of gallons of tea n consumed by the average U.S. consumer can be approximated by $n = \frac{1}{10}d + 7$, where d is the number of years since 1991.
- How many gallons were consumed by the average U.S. consumer in 2008?
 - In what year will the average number of gallons consumed be 11?
30. Two angles are complementary. If the measure of one angle is two degrees less than three times the measure of the second, find the measure of each angle.
31. Two angles are supplementary. If the measure of one angle is ten degrees less than three times the measure of the second, find the measure of each angle.
32. The measure of the second angle of a triangle is three times the measure of the first. The measure of the third angle of the triangle is ten degrees less than the measure of the first. Find the measure of all three angles.
33. The perimeter of a rectangle is 60 cm. The width is 8 cm less than the length. Find the width and length of the rectangle.
34. Mike needs to rent a truck to move his mother. We-R-Trucks rents the truck he needs for \$55 per day plus 45¢ per mile. If he needs the truck for one day, how many miles can he drive and stay within a budget of \$100?
35. There were 200 tickets sold for a basketball game. Tickets for students were \$12 each and all other tickets were \$18 each. The total amount collected was \$2700. How many of each type of ticket were sold?
36. Jenna needs 100 liters of 15% alcohol solution. If she has a 12% alcohol solution and a 20% alcohol solution available, how much of each should she mix to get the desired solution?
37. Zelda wishes to mix almonds worth \$9.60 per pound with cashews worth \$10.70 per pound to make 250 pounds of a mixture worth \$9.93 per pound. How much of each type of nut should she use?
38. The length of a rectangle is one foot less than three times the width. Find the length and width if the area is 30 square feet.
39. A water pipe runs diagonally under a rectangular garden that is 7 feet longer than it is wide. If the pipe is 13 feet long, what are the dimensions of the garden?

40. The length of one leg of a right triangle is 12 meters. The length of the hypotenuse is 8 meters longer than the other leg. Find the lengths of the hypotenuse and the other leg of the triangle.

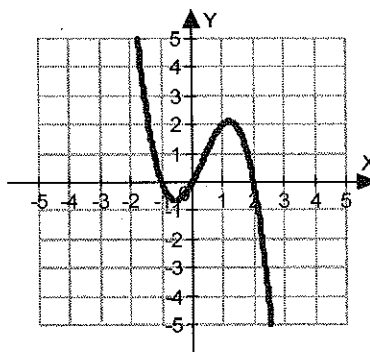
Functions

41. Are the following graphs the graphs of functions?

a)



b)



42. Let $f(x) = 2x + 1$, $g(x) = -3x^2 + x$, and $h(x) = \frac{x+2}{x-5}$. Find the following:

a) $f(-2)$

e) $h(0)$

g) $h(5)$

b) $g(-2)$

f) $h\left(\frac{1}{2}\right)$

c) $f(0)$

d) $g(0)$

43. The formula $F(C) = \frac{9}{5}C + 32$ gives the Fahrenheit temperature as a function of the Celsius temperature.

- a) Find the Fahrenheit temperature when $C = 0^\circ$.
 b) Find the Fahrenheit temperature when $C = 20^\circ$.

44. The formula $C(F) = \frac{5}{9}(F - 32)$ gives the Celsius temperature as a function of the Fahrenheit temperature.

- a) Find the Celsius temperature when $F = 0^\circ$.
 b) Find the Celsius temperature when $F = 32^\circ$.

45. The average price of a home in Austin, Texas can be approximated by the function $P(t) = 6.1t + 71$ where t is the number of years since 1990 and the price P is given in thousands of dollars.

- a) Find the average price of a home in Austin in 2014.
 b) In what year will the average home in Austin cost \$280,000?

Exponents and Polynomials

46. Simplify each expression using the properties of exponents

a) $3^3 \cdot 3^2$

b) $x^4 \cdot x^2$

c) $(2x^4y^3) \cdot (-3xy^2)$

d) $\frac{2^5}{2^2}$

e) $\frac{x^4}{x^2}$

f) $\frac{20x^6}{-4x^2}$

g) $\frac{-10x^5y^4}{4x^4y^2}$

47. Simplify each expression using the properties of exponents. Use only positive exponents in your answer.

a) $2^{-3} \cdot 2^2$

b) $(x^{-1}y^3) \cdot (x^2y^{-5})$

c) $\frac{x^4}{x^{-2}}$

d) $\frac{x^{-4}}{x^{-2}}$

e) $\frac{x^{-2}}{x^{-4}}$

f) $\frac{5x^{-8}}{y^{-4}z^2}$

g) $(x^4)^3$

h) $(-y^2)^4$

i) $(a^2b^5)^2$

j) $(-2x^{-3}y^4)^2$

k) $(2ab^{-2})^5(-2a^3b^4)^3$

l) $\left(\frac{2}{y}\right)^3$

m) $\left(\frac{2^3}{3^2}\right)^2$

n) $\left(\frac{-y^2}{x^5}\right)^4$

o) $\left(\frac{ab^4}{c^3}\right)^3$

p) $\left(\frac{-2x^2y}{3z^3}\right)^3$

q) $\left(\frac{-2x^2y}{3z^3}\right)^0$

r) $\left(\frac{-2x^{-2}y}{3z^3}\right)^3 \left(\frac{-x^2z^2}{2y^{-1}}\right)^{-2}$

s) $(64)^{1/4}$

t) $(-27)^{-1/3}$

u) $\sqrt{20x^3}$

v) $\sqrt[3]{54x^4y^5}$

Scientific Notation

48. The distance to sun is 9.3×10^7 miles. Express this number in standard form.

49. A light year is the distance light can travel in one year. This can be written in scientific notation as 9.46×10^{12} km. How many kilometers is this?

50. Calculate $(-3.8 \times 10^3)(7.2 \times 10^{-6})$.

51. Calculate $\frac{6 \times 10^3}{4 \times 10^6} 1.2 \times 10^2$.

Polynomials

52. Perform the indicated operation, then combine like terms.

a) $(-x^2y^2 + 4xy - 5y^2) + (-4x^2y^2 - 4xy - 15y^2)$

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

c) $(4x - 1)(2x^2 - 3x + 4)$

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

e) $(3x - 2)^2$

f) $(2x + 5y)^2$

Answers

1. a) 17 b) 24 c) 9 d) -34 e) $\frac{34}{5}$

2. a) -54 b) 0 c) -28 d) -18

3. a) $x = \frac{7}{29}$ b) $x = -5$ c) $x = -\frac{3}{5}$ d) $x = -4$ e) $x = -\frac{5}{2}$

f) x is any real number (identity) g) no solution h) $x = -\frac{5}{2}$

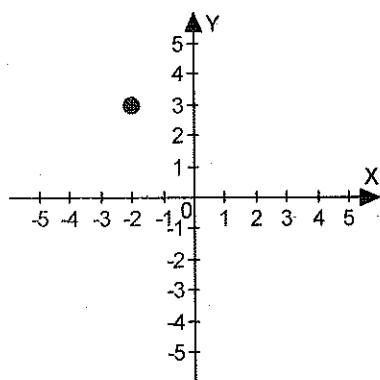
4. a) $x < -2$ b) $x < -\frac{7}{5}$ c) $x \geq -\frac{3}{2}$ d) $x \leq \frac{199}{31}$ e) $x > \frac{15}{7}$ f) $x \leq \frac{55}{7}$

g) $x \geq \frac{1}{18}$

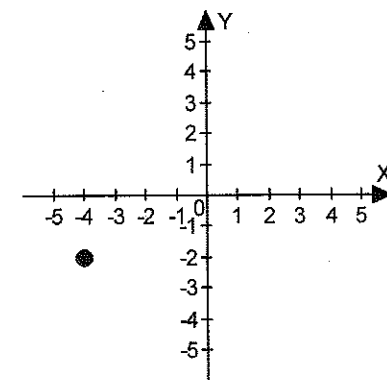
5. a) $m = \frac{y-b}{x}$ b) $F = \frac{9}{5}C + 32$ c) $d = \frac{3F-C}{2}$ d) $t = \frac{A-P}{Pr}$ e) $r = \frac{A-P}{Pt}$

f) $P = \frac{A}{1+Pr}$ g) $l = \frac{P-2w}{2}$

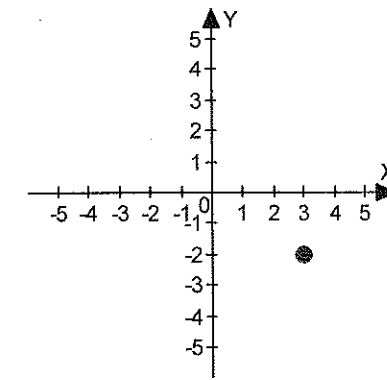
6 a)



Quadrant II



Quadrant III

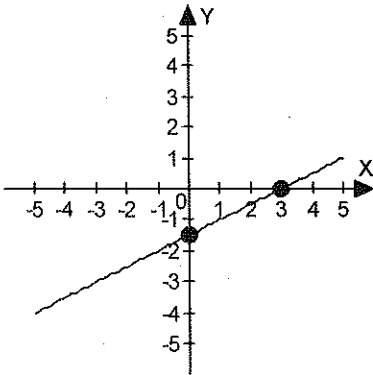


Quadrant IV

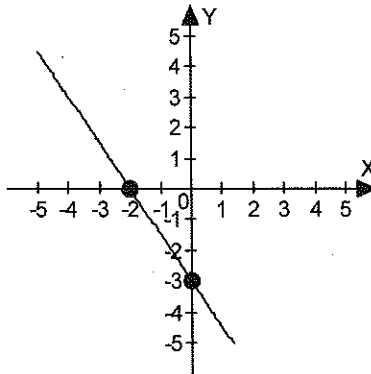
7. a) Solution b) Not a solution c) Solution

8. a) y -intercept $(0, -2)$ b) y -intercept $(0, \frac{5}{2})$ c) y -intercept $(0, -2)$
 x -intercept $(4, 0)$ x -intercept $(-5, 0)$ x -intercept $(4, 0)$

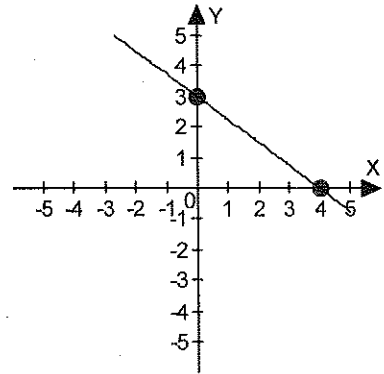
9. a) y -intercept $\left(0, -\frac{3}{2}\right)$
 x -intercept $(3, 0)$



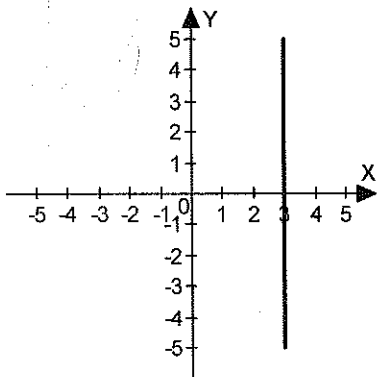
b) y -intercept $(0, -3)$
 x -intercept $(-2, 0)$



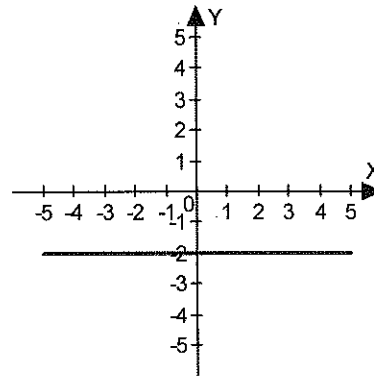
c) y -intercept $(0, 3)$
 x -intercept $(4, 0)$



10. a)



b)



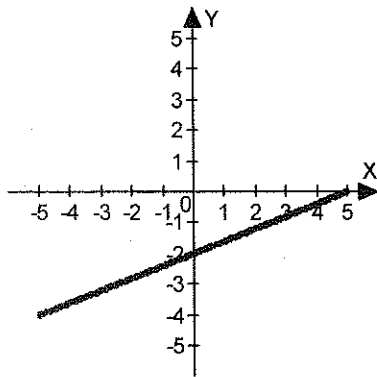
11. a) $m = -\frac{1}{4}$ b) $m = -2$ c) slope is undefined d) $m = 0$

12. a) $m = 2$ b) $m = -\frac{3}{2}$

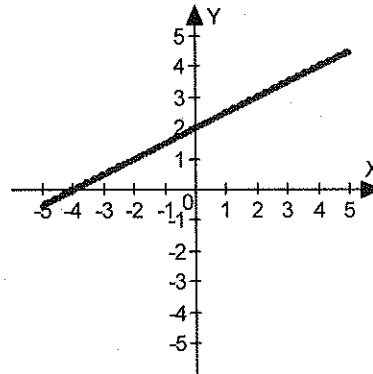
13. a) slope is $m = 3$, y -intercept is $(0, 3)$ b) slope is $m = \frac{5}{7}$, y -intercept is $\left(0, \frac{4}{7}\right)$

c) $y = -\frac{3}{4}x - 2$ d) i. $y = -2x + 4$ ii. $y = -\frac{3}{2}x - 4$

14. a)



b) slope is $1/2$ y -intercept $(0, 2)$



15 a) $y = x - 7$

b) $y - 4 = -6(x + 3)$

c) $x = -1$

d) $y = 4$

e) $y - 1 = \frac{1}{2}(x + 1)$

f) $y - 1 = -2(x + 1)$

16. a) $-x(6x^2 - 8x - 1)$ b) $3x(2x^2 - 3x + 4)$ c) $(x + y)(3 - 5x)$ d) $(x + 3)(3x^2y - 1)$

17. a) $(x + 3)(x^2 + 1)$ b) $(2x - 1)(x^2 - 5)$ c) $(x - 2y)(4x - 3)$ d) $(y + 5)(x - 2z)$

e) $x(x - 5)(x^2 + 2)$

18. a) $(x + 1)(x + 3)$ b) $(x - 10)(x - 3)$ c) $x(x - 7)(x + 4)$ d) $(x + 4y)(x + 7y)$

e) $3(x - 10)(x + 2)$ f) $5xy(x - 8y)(x + 3y)$

19. a) $(2x - 1)(4x - 5)$ b) $(x - 2)(3x + 5)$ c) $(x + 4)(8x + 1)$ d) $(x + 2)(2x + 3)$

e) $(x + 6)(3x + 2)$ f) $2(2x - y)(3x + 4y)$

20. a) $(x - 4y)(x + 4y)$ b) $4(x + 3y)(x - 3y)$ c) $(x - y + 6)(x - y - 6)$

21. a) $(x + 8)^2$ b) $(2x + 3)^2$ c) $(3x - 2)^2$ d) $(2y - 7x)^2$

22. a) $(x - 2y)(x^2 + 2xy + 4y^2)$ b) $(1 - 2y)(4y^2 + 2y + 1)$ c) $(3x - y)(9x^2 + 3xy + y^2)$

d) $(x + 5)(x^2 - 5x + 25)$

23 a) $x = -3, -1$ b) $x = -4, 0, 7$ c) $x = -\frac{5}{3}, 2$ d) $x = -4, -\frac{1}{8}$

e) $x = -6, -\frac{2}{3}$ f) $x = -8$ g) $x = -\frac{3}{2}$ h) $x = \frac{2}{3}$

i) $x = -2, \frac{4}{3}$ j) $x = -1 \pm \sqrt{3}$ k) $x = -3 \pm \sqrt{11}$ l) $x = 2 \pm \sqrt{11}$

24 a) $\frac{x - 3}{x + 3}$ b) $\frac{2(x + 2)}{x - 3}$ c) 1

d) 1 e) 2 f) $\frac{1}{x + 5}$

25. a) (1,4) b) $\left(-\frac{91}{19}, -\frac{32}{19}\right)$ c) (3.8, -1.2) d) (2, -1) e) (47, 18) f) no solution

26. \$23.00 27. \$250.00 28. $30^\circ, 90^\circ$, and 60° 29. a) 8.7 gallons b) 2031 30. 23° and 67°

31. 47.5° and 132.5° 32. $38^\circ, 114^\circ$, and 28° 33. 19 cm by 11 cm 34. 100 miles

35. 150 student tickets for \$12 each and 50 of the \$18 tickets were sold.

36. 62.5 liters of 12% solution; 37.5 liters of 20%.

37. 175 pounds of almonds; 75 pounds of cashews

38. $3w^2 - w = 30$; $3\frac{1}{3}$ feet by 9 feet 39. $w^2 + (w + 7)^2 = 13^2$; 5 feet by 12 feet

40. $x^2 + 12^2 = (x + 8)^2$; The hypotenuse is 13 meters long and the other leg of the triangle is 5 meters long.

41. a) not a function b) function

42. a) $f(-2) = -3$ b) $g(-2) = -14$ c) $f(0) = 1$ d) $g(0) = 0$

e) $h(0) = -\frac{2}{5}$ f) $h\left(\frac{1}{2}\right) = -\frac{5}{9}$ g) $h(5) = \text{not defined}$

43. a) $F(0) = 32^\circ$ b) $F(20) = 68^\circ$

44. a) $C(0) = -\frac{160}{9} = 17.7$ b) $F(32) = 0^\circ$

45. a) \$217,400.00 b) 2024

46. a) 3^5 b) x^6 c) $-6x^5y^5$ d) 2^3

e) x^2 f) $-5x^4$ g) $-\frac{5}{2}xy^2$

47. a) $\frac{1}{2}$ b) $\frac{1}{x^2y^2}$ c) x^6 d) $\frac{1}{x^2}$ e) x^2

f) $\frac{5y^4}{x^8z^2}$ g) x^{12} h) y^8 i) a^4b^{10} j) $\frac{4y^8}{x^6}$

k) $-256a^{14}b^2$ l) $\frac{8}{y^3}$ m) $\frac{64}{81}$ n) $\frac{y^8}{x^{20}}$ o) $\frac{a^3b^{12}}{c^9}$

p) $\frac{-8x^6y^3}{27z^9}$ q) 1 r) $\frac{-32}{27x^{10}y^5z^{13}}$ s) $2\sqrt[4]{4}$ t) $-\frac{1}{3}$

u) $2x\sqrt{5x}$ v) $3xy^3\sqrt{2xy^2}$

48. 93,000,000 million miles 49. 94,600,000,000,000 kilometers

50. -2.736×10^{-2} 51. 1.8×10^1

52. a) $-20y^2 - 5x^2y^2$ b) $4x^2 - 5x + 6$ c) $8x^3 - 14x^2 + 19x - 4$

d) $x^3 + x^2 - 5x - 6$ e) $9x^2 - 12x + 4$ f) $4x^2 + 20xy + 25y^2$