

Name: \_\_\_\_\_



Attached is an assignment containing items necessary for you to have mastered to do well in Pre Calculus.

**Please complete the assignment for the class you will begin in September 2019.**

Practicing mathematics skills is especially important over the long summer break, so this summer assignment is meant to be completed over the entire summer, not all at once.

**This assignment must be completed and handed in by the second day of school.** The packet will be graded for completion and assigned an individual practice grade. To earn the full points for completion, you must show your work. **No late submissions of the summer assignment will be accepted;** please be prepared to hand it in on time.

Your teacher will review the assignment and may follow up with a formative assessment.

You may wish to utilize the following online resources:

- [www.khanacademy.com](http://www.khanacademy.com)
- [www.ixl.com](http://www.ixl.com)
- [www.purplemath.com](http://www.purplemath.com)
- [www.math.com](http://www.math.com)

Enjoy your summer!

## Pre Calculus Summer Assignment 2019

### 1.1 – Rectangular Coordinates

Find (a) the distance between the points, and (b) the midpoint of the line segment joining the points.

1)  $(-2, 6), (4, -3)$

2)  $(0, -1.2), (-3.6, 0)$

3) The volume of a globe is about 47,712.94 cubic centimeters. Find the radius of the globe.

4) The volume of a rectangular package is 2304 cubic inches. The length of the package is 3 times its width, and the height is 1.5 times its width. Find the dimensions of the package.

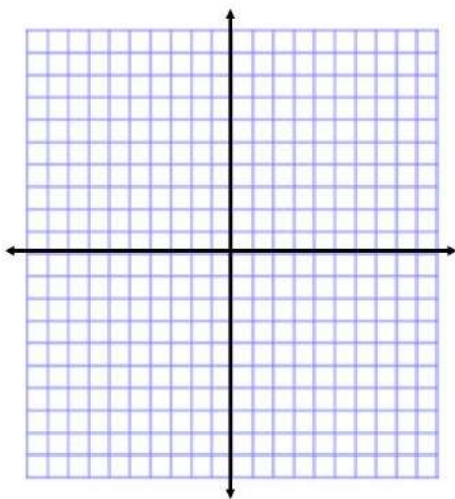
### 1.2 – Graphs of Equations

Sketch the graph by hand.

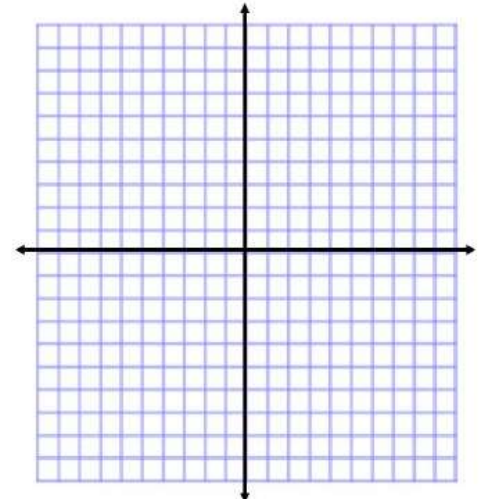
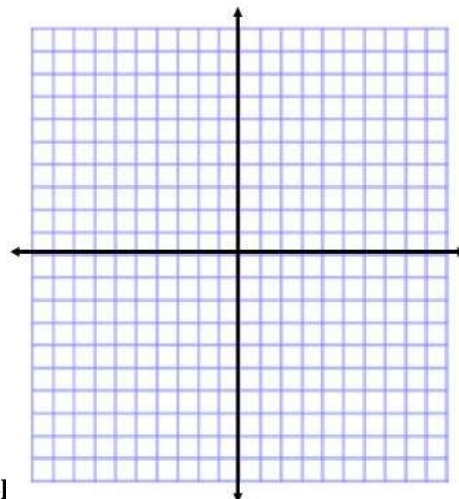
5)  $3x + 2y + 6 = 0$

6)  $y = \sqrt{5 - x}$

7)  $y = x^2 - 4x$



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8)  $y = 2x - 7$

9)  $y = |x + 1| - 3$

10)  $y = (x - 3)^2 - 4$

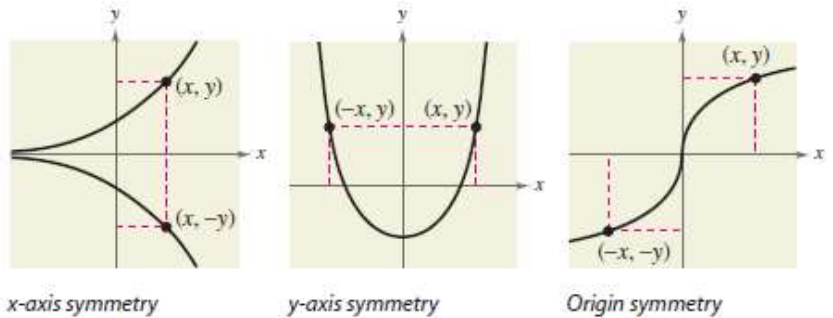
11)  $y = x\sqrt{4 - x^2}$

**Graphical Tests for Symmetry**

1) A graph is **symmetric with respect to the x-axis** if, whenever  $(x, y)$  is on the graph,  $(x, -y)$  is also on the graph.

2) A graph is **symmetric with respect to the y-axis** if, whenever  $(x, y)$  is on the graph,  $(-x, y)$  is also on the graph.

3) A graph is **symmetric with respect to the origin** if, whenever  $(x, y)$  is on the graph,  $(-x, -y)$  is also on the graph.



Use the algebraic tests to check for symmetry with respect to both axes and the origin.

12)  $y = 5x - 6$

13)  $y = 5 - x^2$

14)  $y = x^3 + 3$

15)  $y = \sqrt{x + 5}$

16)  $y = |x| + 9$

**Standard Form of the Equation of a Circle**

The point  $(x, y)$  lies on the circle of radius  $r$  and center  $(h, k)$  if and only if:

$$(x - h)^2 + (y - k)^2 = r^2$$

**Find the center and radius of the circle.**

17)  $x^2 + y^2 = 9$

18)  $x^2 + (y - 8)^2 = 81$

19)  $(x + 4)^2 + (y - \frac{3}{2})^2 = 100$

20) Find the standard form of the equation of the circle for which endpoints of a diameter are  $(-2, -3)$  and  $(4, -10)$ .

### 1.3 – Linear Equations in Two Variables

**Find the slope and y-intercept of the equation of the line.**

21)  $y = 6$

22)  $x = -3$

23)  $y = -10x + 9$

24)  $5x - 8y + 20 = 0$

**Find the slope of the line passing through the pair of points.**

25)  $(-1, 8), (6, 5)$

26)  $(-4.5, 6), (2.1, 3)$

**Find the slope-intercept form of the equation of the line that passes through the given point and has the indicated slope.**

27) point:  $(-2, 6)$   $m = 0$

28) point:  $(10, -3)$   $m = -\frac{1}{2}$

29) point:  $(-8, 5)$   $m$  is undefined

**Find the slope-intercept form of the equation of the line passing through the points.**

30)  $(0, 0)$ ,  $(0, 10)$

31)  $(2, 5)$ ,  $(-2, -1)$

32)  $(11, -2)$ ,  $(6, -1)$

**Write the slope-intercept forms of the equations of the lines through the given point (a) parallel to the given line and (b) perpendicular to the given line.**

33) point:  $(3, -2)$  line:  $5x - 4y = 8$

34) point:  $(-8, 3)$  line:  $2x + 3y = 5$

**In Exercises 35 and 36, you are given the dollar value of a product in 2006 and the rate at which the value of the product is expected to change during the next 5 years. Use this information to write a linear equation that gives the dollar value  $V$  of the product in terms of the year  $t$ . (Let  $t = 6$  represent 2006.)**

35) 2006 Value: \$12,500  
Rate: \$850 increase per year

36) 2006 Value: \$72.95  
Rate: \$5.15 increase per year

**1.4 – Functions**

Determine whether the equation represents  $y$  as a function of  $x$ .

37)  $16x - y^4 = 0$

38)  $2x - y - 3 = 0$

39)  $y = \sqrt{1 - x}$

40)  $|y| = x + 2$

Evaluate the function at each specified value of the independent variable and simplify.

41)  $f(x) = x^2 + 1$

a)  $f(2)$

b)  $f(-4)$

c)  $f(t^2)$

d)  $f(t + 1)$

42)  $h(x) = \begin{cases} 2x + 1, & x \leq -1 \\ x^2 + 2, & x > -1 \end{cases}$

a)  $h(-2)$

b)  $h(-1)$

c)  $h(0)$

d)  $h(2)$

**Find the domain of the function.**

43)  $f(x) = \sqrt{25 - x^2}$

44)  $f(x) = 3x + 4$

45)  $h(x) = \frac{x}{x^2 - x - 6}$

46)  $h(t) = |t + 1|$

47) The velocity of a ball projected upward from ground level is given by  $v(t) = -32t + 48$  where  $t$  is the time in seconds and is the velocity in feet per second.

(a) Find the velocity when  $t = 1$ .

(b) Find the time when the ball reaches its maximum height. [*Hint*: Find the time when  $t = 0$ .]

(c) Find the velocity when  $t = 2$ .

48) From a full 50-liter container of a 40% concentration of acid,  $x$  liters is removed and replaced with 100% acid.

(a) Write the amount of acid in the final mixture as a function of  $x$ .

(b) Determine the domain and range of the function.

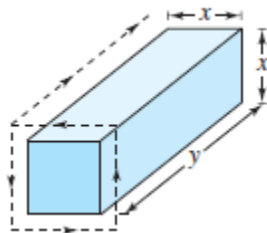
(c) Determine if the final mixture is 50% acid.

49) Write the area  $A$  of a square as a function of its perimeter  $P$ .

50) Write the area  $A$  of a circle as a function of its circumference  $C$ .



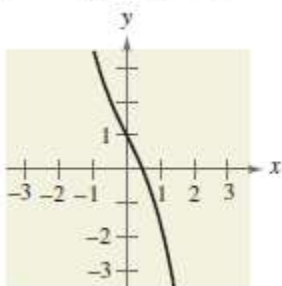
51) A rectangular package to be sent by the U.S. Postal Service can have a maximum combined length and girth (perimeter of a cross section) of 108 inches (see figure). Write the volume  $V$  of the package as a function of  $x$ . What is the domain of the function?



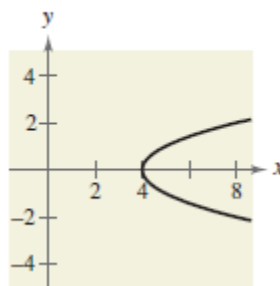
### 1.5 – Analyzing Graphs of Functions

Use the Vertical Line Test to determine whether  $y$  is a function of  $x$ .

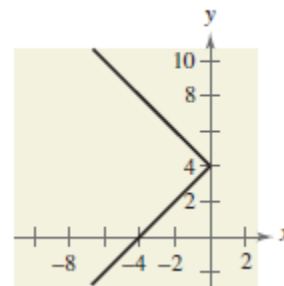
52)  $y = -\frac{3}{5}x^3 - 2x + 1$



53)  $x - 4 = y^2$



54)  $x = -|4 - y|$



Find the zeros of the function algebraically.

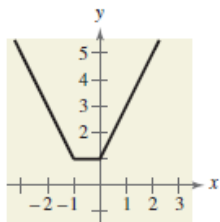
55)  $f(x) = 3x^2 - 16x + 21$

56)  $f(x) = \frac{8x+3}{11-x}$

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

58) Determine the intervals over which the function is increasing, decreasing, or constant.

$$f(x) = |x| + |x + 1|$$



Use a graphing utility to graph the function and approximate (to two decimal places) any relative minimum or relative maximum values.

59)  $f(x) = -x^2 + 2x + 1$

60)  $f(x) = x^4 - 4x^2 - 2$

61)  $f(x) = x^3 - 4x^2 + x - 1$

Find the average rate of change of the function from  $x_1$  to  $x_2$ .

$$\text{Average rate of change} = \frac{f(x_2) - f(x_1)}{x_2 - x_1}$$

*Function*

*x-Values*

62)  $f(x) = x^3 + 12x - 2$

$x_1 = 0, x_2 = 4$

63)  $f(x) = 1 - \sqrt{x + 3}$

$x_1 = 1, x_2 = 6$

### Tests for Even and Odd Functions

1) A function  $y = f(x)$  is **even** if, for each  $x$  in the domain of  $f$ ,

$$f(-x) = f(x)$$

In other words, if  $y = f(x)$  is **symmetric with respect to the y-axis**, it is also **even**.

2) A function  $y = f(x)$  is **odd** if, for each  $x$  in the domain of  $f$ ,

$$f(-x) = -f(x)$$

In other words, if  $y = f(x)$  is **symmetric with respect to the origin**, it is also **odd**.

**Determine whether the function is odd, even, or neither.**

64)  $f(x) = x^5 + 4x - 7$

65)  $f(x) = x^4 - 20x^2$

66)  $f(x) = 2x\sqrt{x^2 + 3}$

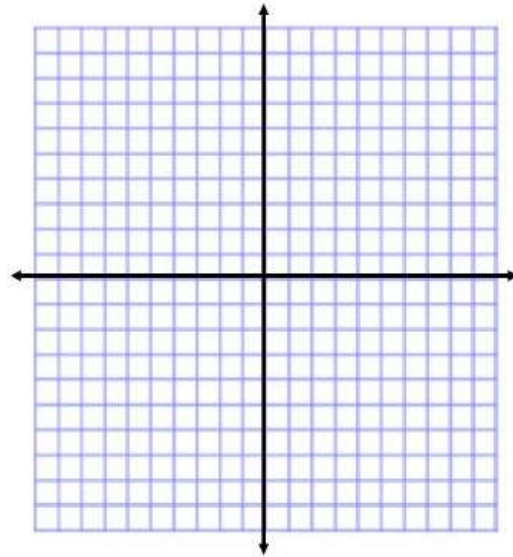
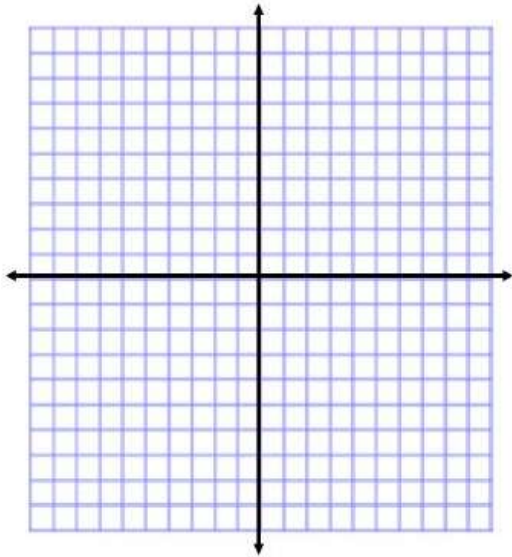
67)  $f(x) = \sqrt[5]{6x^2}$

1.6 – A Library of Parent Functions

Graph the function.

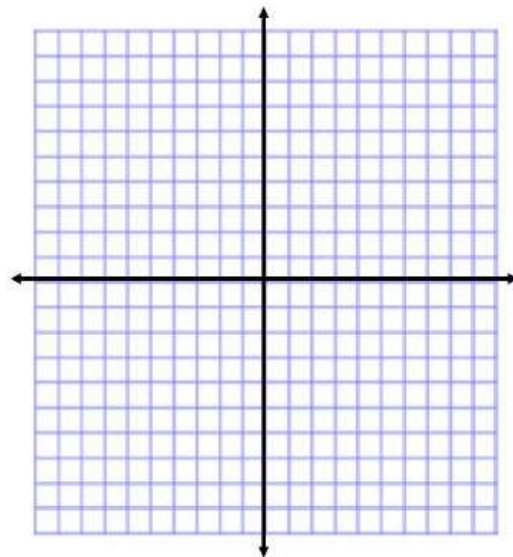
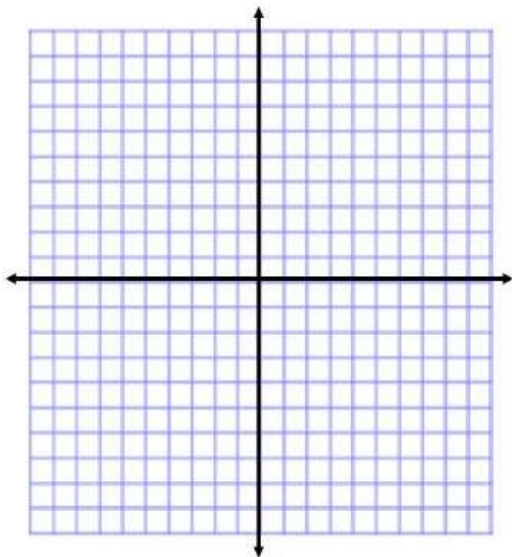
68)  $f(x) = 3 - x^2$

69)  $h(x) = x^3 - 2$

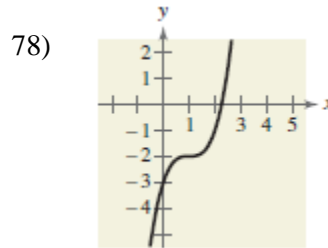
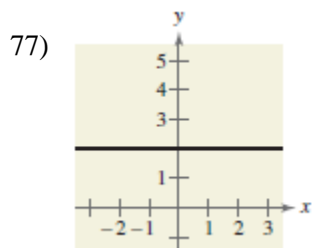
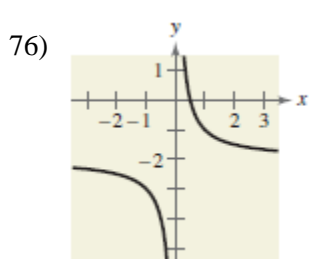
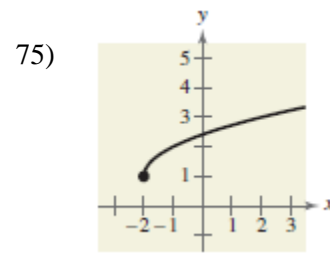
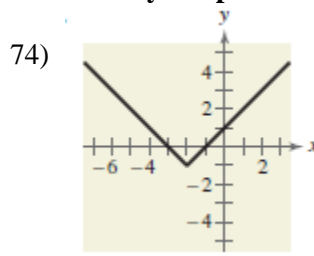
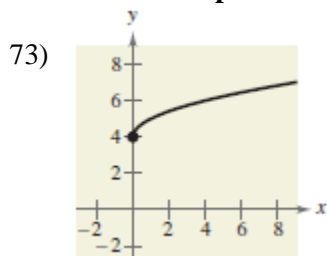
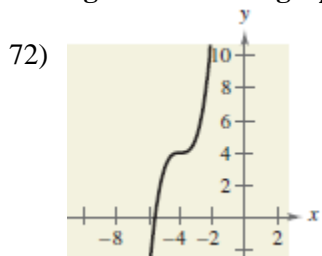


70)  $f(x) = -\sqrt{x}$

71)  $g(x) = \frac{3}{x}$



The figures show the graph of a transformed parent function. Identify the parent function.



### 1.7 – Transformations of Functions

In Exercises 75–79,  $h$  is related to one of the parent functions that you learned in Algebra II.

- Identify the parent function  $f$ .
- Describe the sequence of transformations from  $f$  to  $h$ .
- Use function notation to write  $h$  in terms of  $f$ .

79)  $h(x) = x^2 - 9$

80)  $h(x) = -(x - 5)^3 - 5$

81)  $h(x) = -(x + 3)^2 + 1$

$$82) h(x) = -\sqrt{x+1} + 9$$

$$83) h(x) = -|-x+4| + 6$$

$$84) h(x) = -\frac{1}{3}x^3$$

$$85) h(x) = \frac{1}{2}|x| - 1$$

<b>1.8 – Combinations of Functions: Composite Functions</b>
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Find the following for each set of functions listed below.

(a)  $(f + g)(x)$

(b)  $(f - g)(x)$

(c)  $(fg)(x)$

(d)  $(f/g)(x)$

$$86) f(x) = x^2 + 3, \quad g(x) = 2x - 1$$

$$87) f(x) = x^2 - 4, \quad g(x) = \sqrt[3]{x+7}$$

Find (a)  $f \circ g$  and (b)  $g \circ f$ . Find the domain of each function and each composite function.

88)  $f(x) = \frac{1}{3}x - 3$ ,  $g(x) = 3x + 1$

89)  $f(x) = x^3 - 4$ ,  $g(x) = \sqrt[3]{x + 7}$

90) The number  $N$  of bacteria in a refrigerated food is given by

$$N(T) = 25T^2 - 50T + 300, \quad 2 \leq T \leq 20$$

where  $T$  is the temperature of the food in degrees Celsius. When the food is removed from refrigeration, the temperature of the food is given by

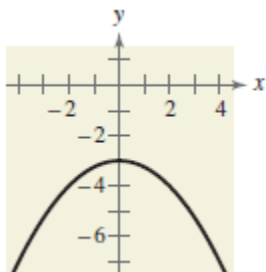
$$T(t) = 2t + 1, \quad 0 \leq t \leq 9$$

where  $t$  is the time in hours (a) Find the composition  $N(T(t))$ , and interpret its meaning in context, and (b) find the time when the bacterial count reaches 750.

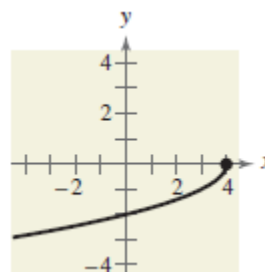
## 1.9 – Inverse Functions

Determine whether the function has an inverse function.

91)



92)



<b>Rational Expression: All Operations</b>
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**Simplify** (*remember to factor when necessary*).

93)  $\frac{120x^3y}{25xy^5}$

94)  $\frac{x^2 + 9x + 20}{2x + 8}$

**Multiply or divide** (*remember to factor when necessary*).

95)  $\frac{5n + 15}{4n + 8} \cdot \frac{2n + 4}{3n + 9}$

96)  $\frac{x^2 - x - 12}{x - 4} \div \frac{2x + 6}{x - 5}$

**Add or subtract** these rational expressions.

97)  $\frac{5}{12x} - \frac{3}{4}$

98)  $\frac{4}{7x - 35} + \frac{5}{x - 5}$