

IV. Solving Equations (Review) 1.3

A. Linear Equations

Form: $ax + b = 0$, $a \neq 0$.

Ex: Solve

$$2(x - 3) + \frac{x}{5} = 69 - 3(x - 1)$$

B. Quadratic Equations

Form: $ax^2 + bx + c = 0$, $a \neq 0$.

Ex: Solve by factoring.

1) $6x^2 + 13x = 5$

2) $(x + 3)(x - 1) = 32$

Quadratic Formula

Form: $ax^2 + bx + c = 0$

Solution: $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Ex: Solve $4x^2 - 8x + 1 = 0$

- Find exact solution.
- Use calculator to approximate to two decimal places.

Ex: The surface area of a cylindrical can with no top is given by

$$S = \pi r^2 + 2\pi r h ,$$

where h is the height and r is the radius.

- Solve for h .
- Solve for r .

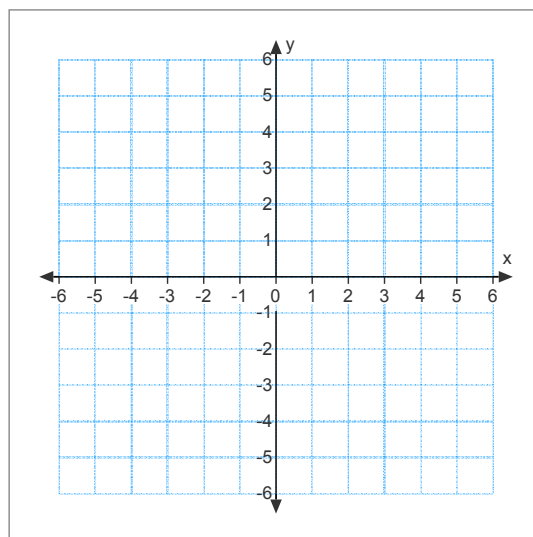
C. Rational Equations

Ex: Solve $\frac{x}{x+5} - \frac{2}{x-3} = \frac{-16}{x^2+2x-15}$

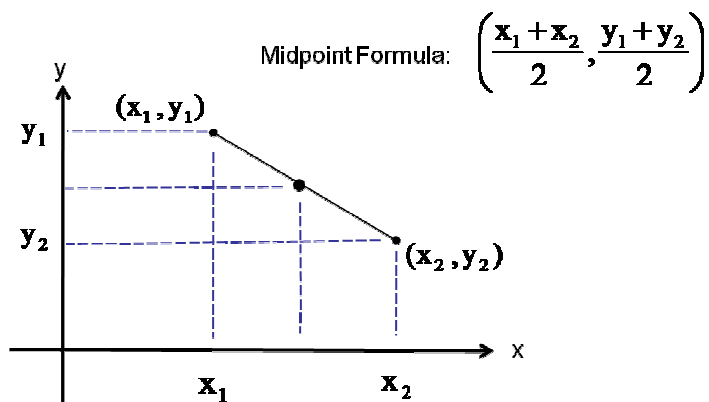
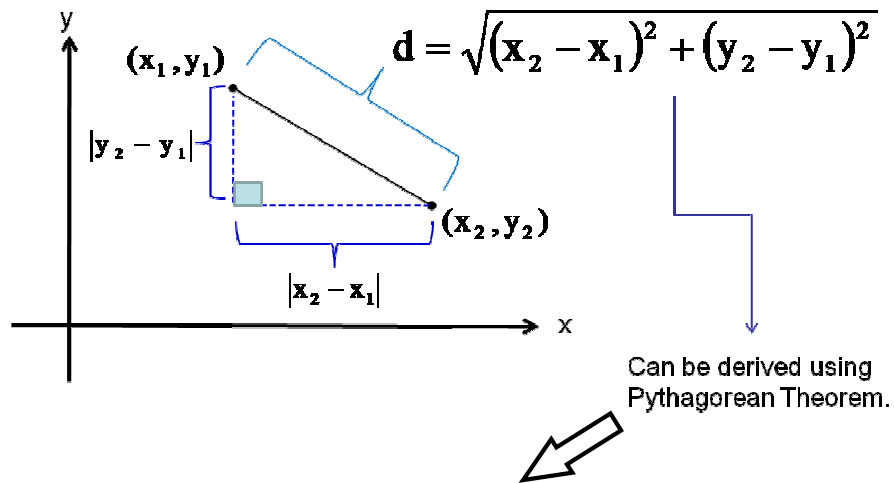
V. Rectangular Coordinates 1.5

Ex: Plot & identify quadrant which point lies.

| X | Y |
|----|----|
| 3 | 5 |
| 5 | 3 |
| -4 | 6 |
| 6 | -5 |
| -4 | -3 |
| 6 | 0 |
| 0 | 3 |



Distance Formula



Ex: A diameter of a circle has end points at $(-2, 5)$ & $(6, -3)$.

- Find the radius of the circle.
- Find the center of the circle.

VI. Graphs 1.5

Def: The **graph** of an equation of two variables is the set of all points with coordinates satisfying the equation.

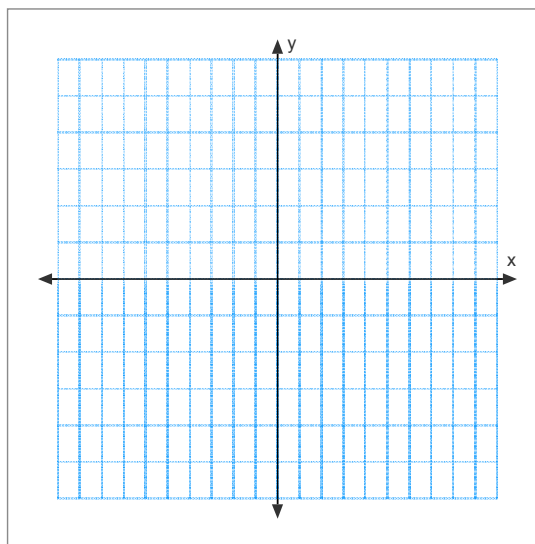
When graphing equations in the Cartesian plane, one technique is to plot points. Often, it is convenient to plot the intercepts.

- Def: The x-intercept(s) is where the graph intersects the x-axis (x-coordinate(s) where $y = 0$).
- Def: The y-intercept(s) is where the graph intersects the y-axis (y-coordinate(s) where $x = 0$).

Ex: Make a table of values & graph.

$$y = \frac{1}{2}x^2 + 1$$

| X | Y |
|----|---|
| -3 | |
| -2 | |
| -1 | |
| 0 | |
| 1 | |
| 2 | |
| 3 | |



Ex: Find the intercepts and use them to help graph the following equation.

$$y = x^3 - 2x^2$$

$$y = 3x^3 - 10x^2 - 13x + 20$$

Here we will look at the graph of the above on different viewing windows.

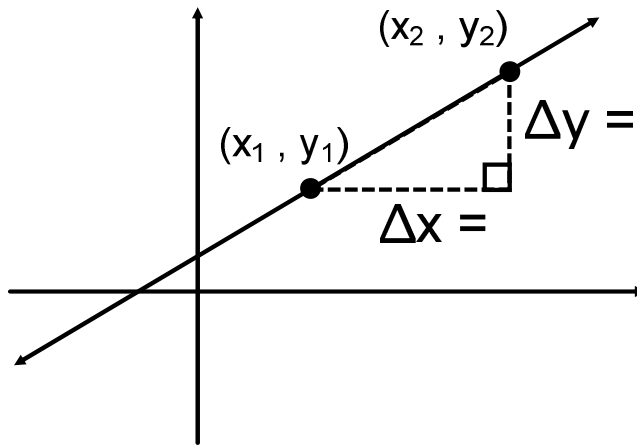
a) $[-10, 10] \times [-10, 10]$

c) $[-5, 5] \times [-30, 30]$

b) $[-3, 3] \times [-10, 30]$

Ex: Approximate the intercepts by using the graph.

VII. Lines 1.6



Def: slope = $m =$

Linear Equation Forms:

$Ax + By + C = 0$

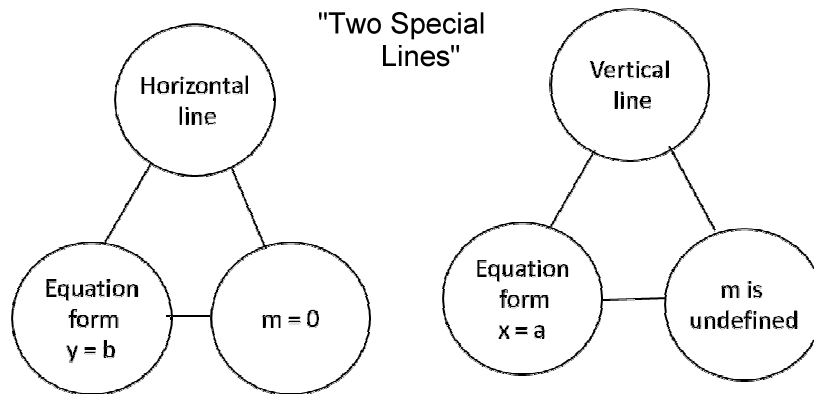
General Form

$y = mx + b$

Slope-intercept Form

$y - y_1 = m(x - x_1)$

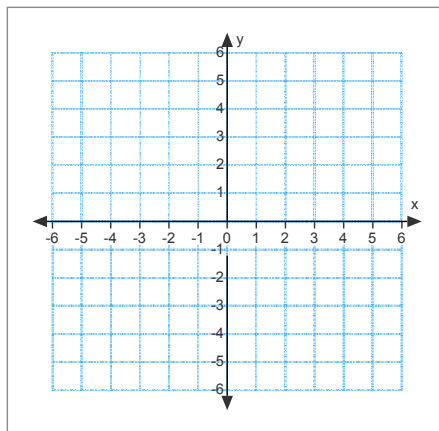
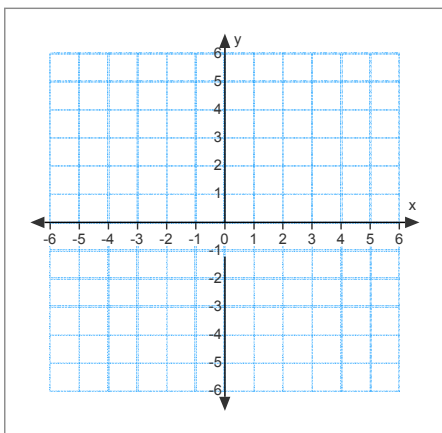
Point-slope Form



Ex: $3x - 4y = 12$

a) Use the intercepts to graph.

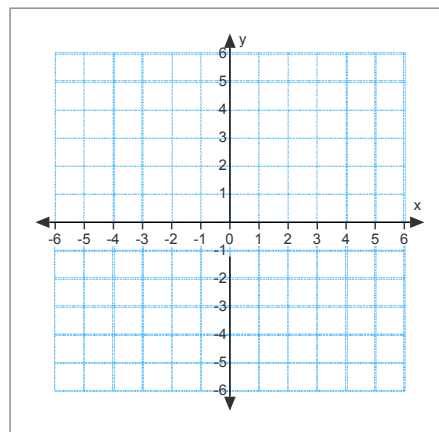
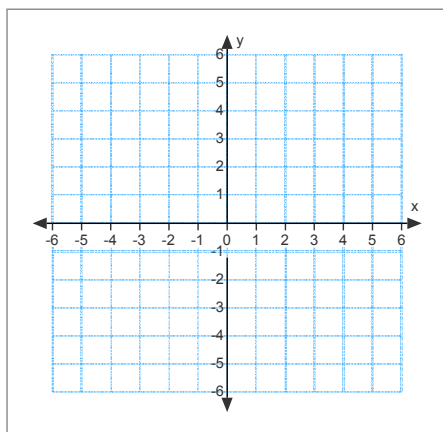
b) Find the slope & y-int. and use them to graph.



Ex: Identify the slope & graph.

a) $x = 3$

b) $y = 4$



Ex: Find the equation of the line that satisfies the following.
Where possible, write final answer in slope-intercept form.

- 1) Slope = $-\frac{2}{3}$ & through (3, -5)
- 2) Through (3, -5) & (-3, 13).
- 3) Through (3, -5) & (3, 13).
- 4) Through (3, -5) & (-3, -5).
- 5) Through (2, -5) and parallel to the line $2x + 3y = 21$.
- 6) Through (2, -5) and perpendicular to the line $2x + 3y = 21$.

Ex: For a typical four bedroom house in Pleasanton, California, during February 1994, Pacific Gas and Electric Company used a baseline quantity of 310.5 kwh (kilowatt-hours) for a cost of \$37.10. The cost of each additional kilowatt-hour was \$0.13737.

- a) Write a linear equation to determine the cost y for electricity where the usage is x kwh over the baseline amount.
- b) If 262 kwh more than the baseline amount were used, what was the total cost of electricity?
- c) How many kwh over the baseline was used if the cost is \$140.13.

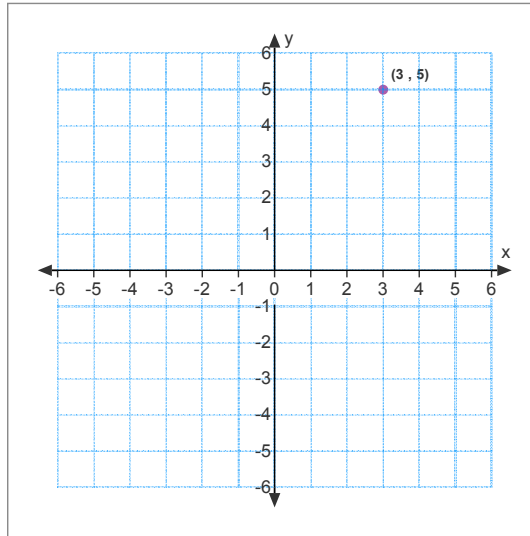
VIII. Symmetry 1.7

Ex: Do the following reflection on the point (3, 5).

a) y-axis reflection

b) x-axis reflection

c) origin reflection



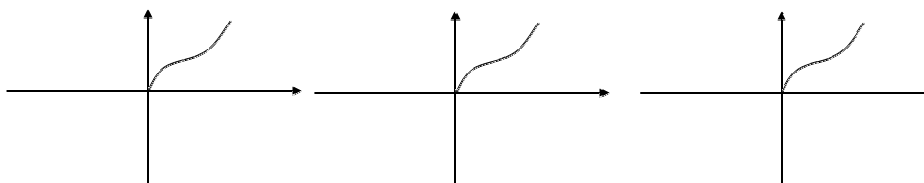
| Types of Symmetry | Geometric Meaning | Graphic Example | Test |
|-------------------|-----------------------|-----------------|---|
| x-axis | Reflects about x-axis | | Replace y with -y results with equivalent equation. |
| y-axis | Reflects about y-axis | | Replace x with -x results with equivalent equation. |
| origin | Reflects about origin | | Replace x with -x & y with -y results with equivalent equation. |

Ex: Complete the following graph so the it displays the given symmetry.

1) y-axis symmetry

2) x-axis symmetry

3) Origin symmetry



Ex: Algebraically test for symmetry & graph.

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

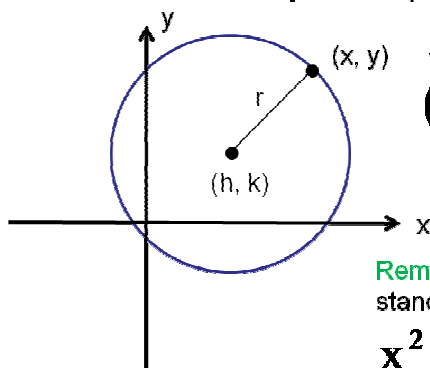
2) $y = x^3 - x$

3) $|y| = x$

4) $|x| + |y| = 4$

IX. Circle

The set of points (x, y) that are a distance r from a fixed point (h, k) defines a circle.



Standard Equation of a circle:

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

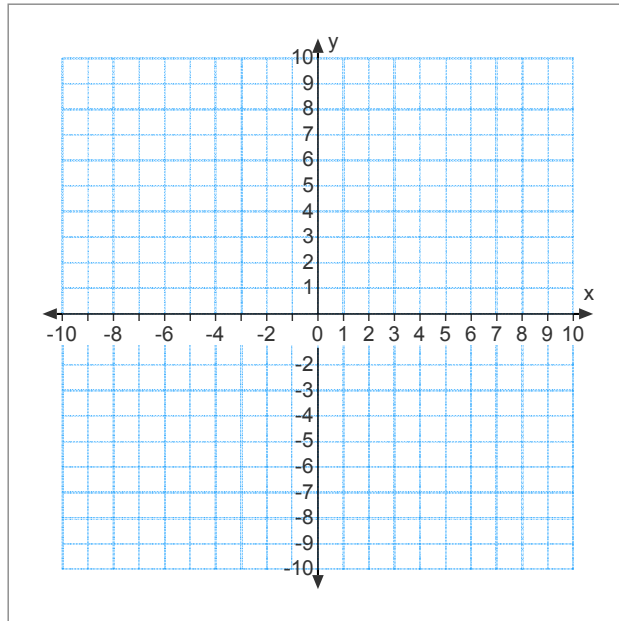
Radius r

Center (h, k)

Remark: If center is $(0, 0)$, then standard equation has form

$$x^2 + y^2 = r^2$$

Ex: Graph $(x-2)^2 + (y+3)^2 = 25$



Ex: 1) Find equation of circle with radius 9 and center $(-4, 3)$.

2) Find center and radius of following circle:

$$x^2 + y^2 - 2x + 8y - 3 = 0$$