Graphing on the Coordinate Plane

Topics of emphasis:

1. Graphing linear functions.

2. Graphing Quadratic Functions.

3. Graphing Rational Functions.

Graphing Linear Functions

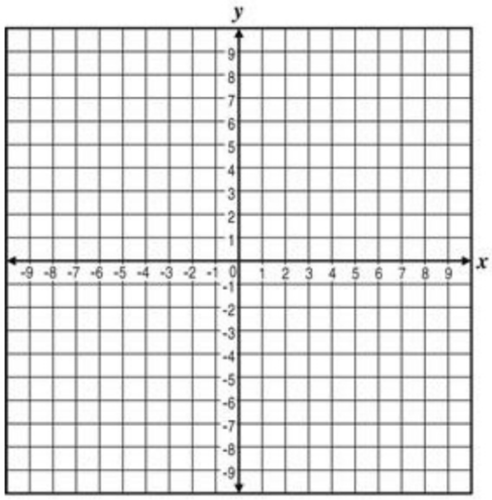
Procedure:

1. Identify which type of setup the equation is given in.
   - Slope-Intercept Form (y = mx + b)
   - A vertical line (x = #)
   - A horizontal line (y = #)
2. IF the equation is in Slope-Intercept Form,
   - Then identify the y-intercept (This is the b value), and place a dot on the y-axis that matches that value.
3. IF the equation is in Slope-Intercept Form,
   - Identify the slope, moving from the y-intercept move to the next point and make a dot.
   - From this dot, use the slope to make another dot.
   - Repeat.
4. Connect the dots with a straight line with arrows at each end of the line!

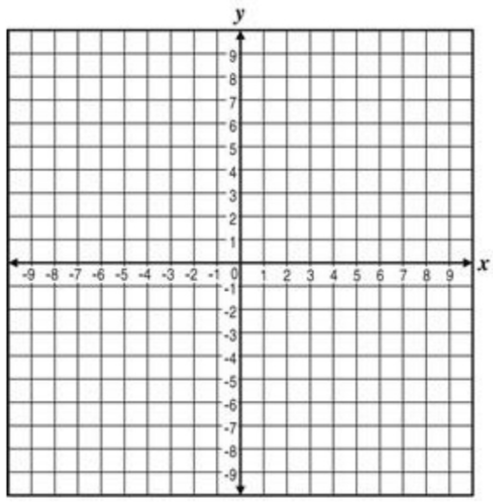
Examples

Graph each of the following Linear Functions:

1. $y = -2x + 5$



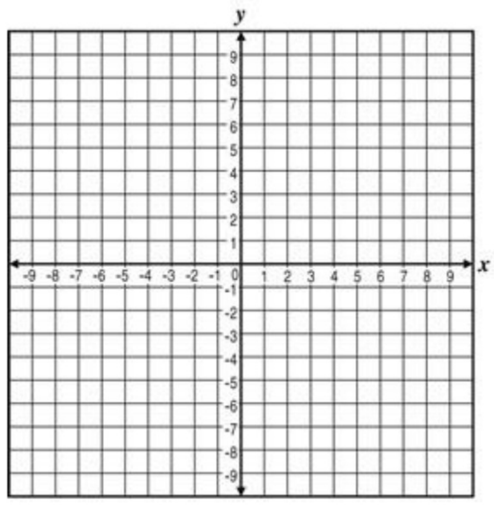
2. $f(x) = \frac{1}{3}x - 8$



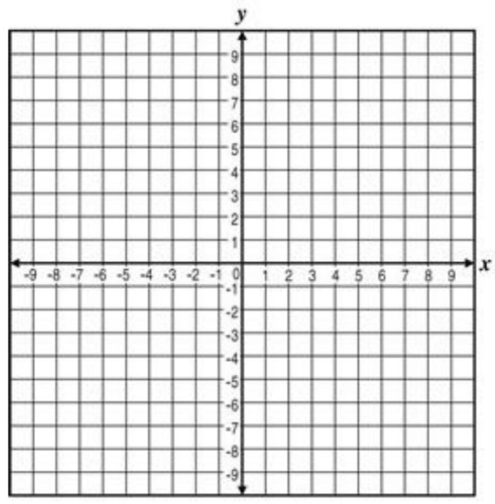
Examples
Special Cases

Graph each of the following Linear Functions:

3. y = 7



4. x = -3



Graphing Quadratic Functions

Standard form:

$$y = ax^2 + bx + c$$

Procedure:

1. Find the Axis of Symmetry $\quad x = \frac{-b}{2a}$
   Graph as a dashed line.

2. Create a table of values placing Step 1 in the middle.
   - Extend your chart 3 integer values to the left
   - Extend your chart 3 integer values to the right.

3. Plot all the points that you can from your chart.

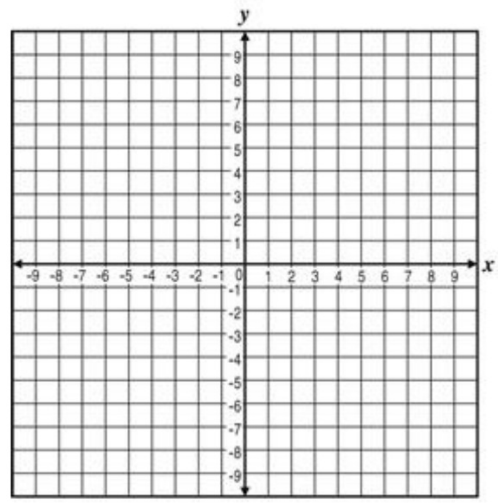
4. Ensure that your graph extends all the way to the end of the graph and has arrows at the ends!

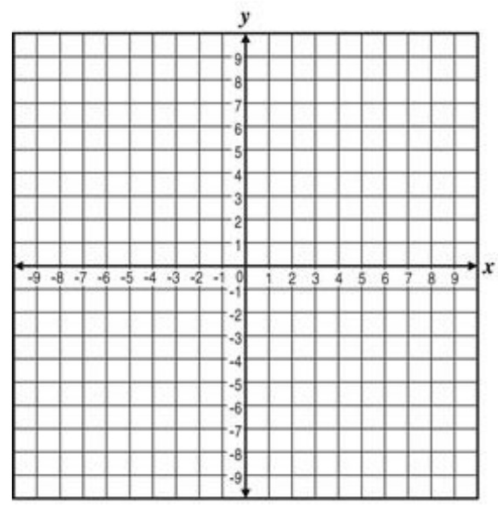
Examples

Graph each of the following Quadratic Functions:

1. $f(x) = -5x^2 - 10x + 6$

2. $h(x) = -6x^2$

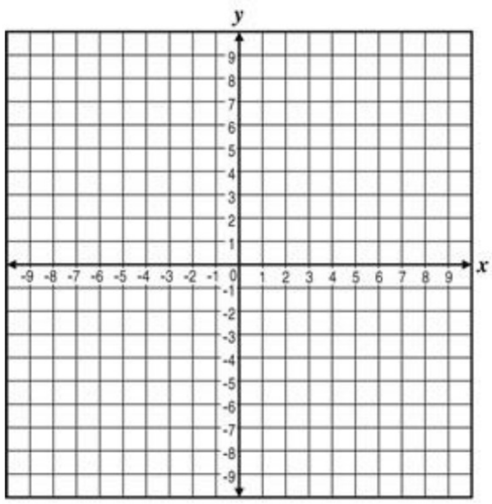




Additional Example

Graph each of the following Quadratic Functions:

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



Graphing Rational Functions

Characteristics of Rational Functions:

Holes:

- Pieces of the graph where the function is undefined.
- Created when a factor is in common in the numerator and the denominator of a rational function.

Vertical Asymptotes:

- Vertical "guidelines"
- To find you set each of the unique factors from the denominator equal to zero and solve the equation.

Horizontal Asymptotes:

- Horizontal "guidelines"
- To find you divide the Numerators Leading Term by the the Denominators Leading Term:
  - IF a variable is left in the denominator, y = 0
  - IF the variables cancel out, y = simplified fraction
  - IF a variable is left in the numerator, then there is a slanted asymptote, the line y = mx

Graphing Rational Functions Continued

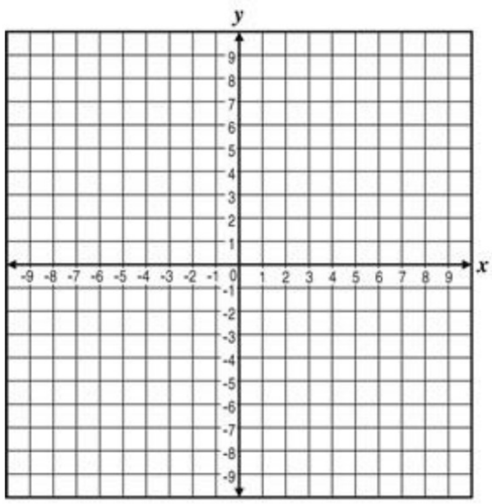
Procedure:

1. Factor the numerator/denominator completely.
2. Check to see if the function has any holes.
3. Check to see what the vertical asymptote(s) is/are and graph it/them as dashed lines.
4. Check to see what the horizontal asymptote is, or if there is a slanted asymptote, and graph it as a dashed line.
5. Plug some values into a chart that will cover 4 values minimal for each blocked off part of the domain (x-values not represented by a vertical asymptote).
6. Plot your points, and create your lines as best as you can placing arrows on each end of both parts of the graph.

Example

Graph each of the following Rational Functions identifying any holes, vertical/horizontal asymptotes:

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

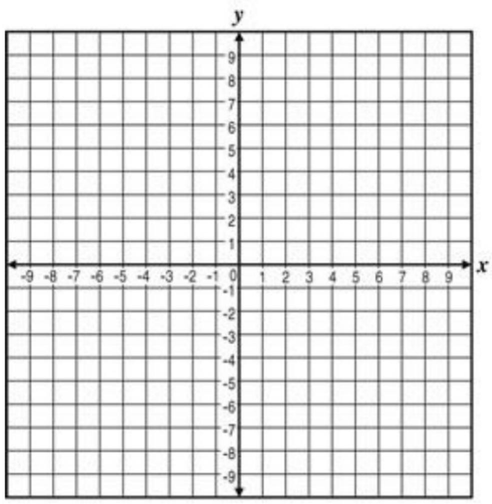


Example

Graph each of the following Rational Functions identifying any holes, vertical/horizontal asymptotes:

2.

$$f(x) = \frac{2x^2 + 10x + 12}{x^2 + 3x + 2}$$

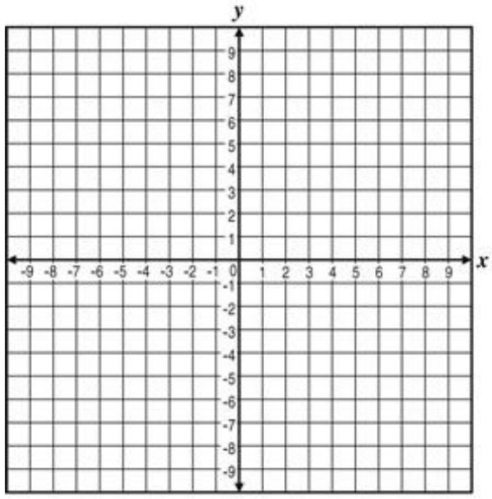


Example

Graph each of the following Rational Functions identifying any holes, vertical/horizontal asymptotes:

3.

$$y = \frac{x^2 - 9}{x - 3}$$

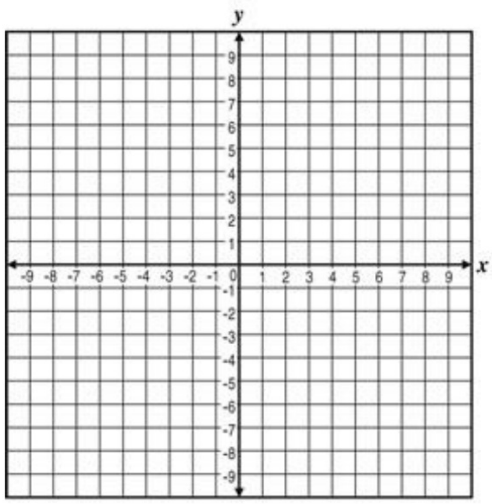


Example

Graph each of the following Rational Functions identifying any holes, vertical/horizontal asymptotes:

4.

$$f(x) = \frac{x^2 - 2x - 3}{x - 2}$$



Example

Graph each of the following Rational Functions identifying any holes, vertical/horizontal asymptotes:

5.

$$f(x) = \frac{2x^2}{x^2 - 1}$$