

**Algebra 2 Honors**  
**Guided Notes: 5.4, Part II**

Name \_\_\_\_\_  
Date \_\_\_\_\_ Block \_\_\_\_\_

**Horizontal Asymptotes**

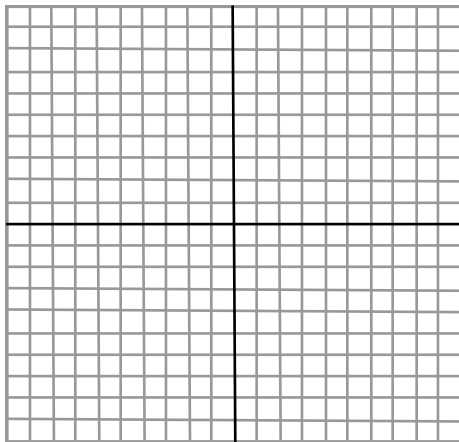
Let  $f(x) = \frac{p(x)}{q(x)}$ , where  $p$  and  $q$  are polynomial functions in standard form with no common factors other than 1. The graph of  $f$  has at most one horizontal asymptote.

- If degree of  $p >$  degree of  $q$ ,
  
  
  
  
  
  
  
  
  
  
- If degree of  $p <$  degree of  $q$ ,
  
  
  
  
  
  
  
  
  
  
- If degree of  $p =$  degree of  $q$ ,

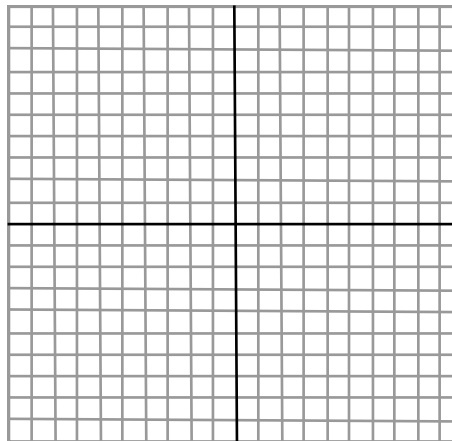
**Examples: Graphing Rational Functions with Vertical and Horizontal Asymptotes**

Identify the zeros and asymptotes of the function. Then graph.

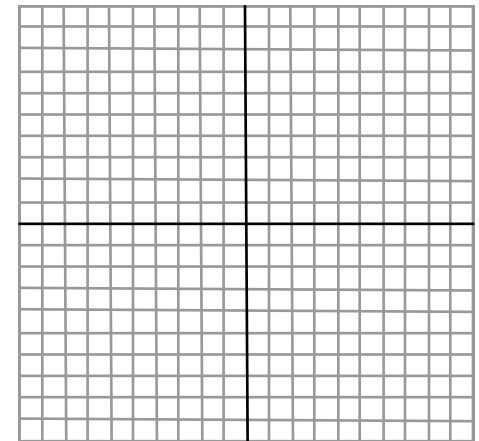
4A.  $f(x) = \frac{x^2 - 3x - 4}{x}$



4B.  $f(x) = \frac{x - 2}{x^2 - 1}$



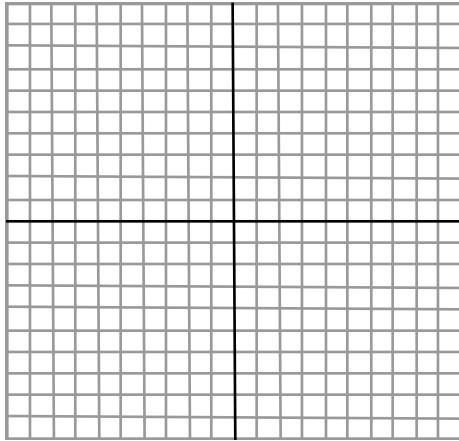
4C.  $f(x) = \frac{4x - 12}{x - 1}$



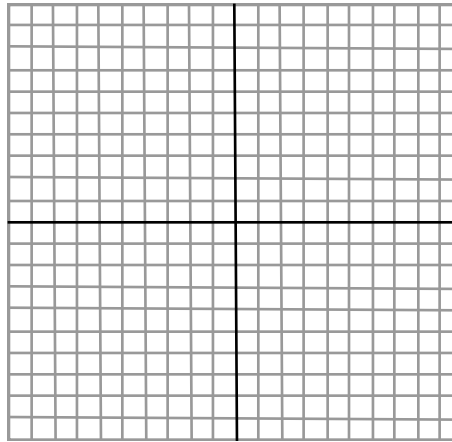
**Check it Out Examples: Graphing Rational Functions with Vertical and Horizontal Asymptotes**

Identify the zeros and asymptotes of the function. Then graph.

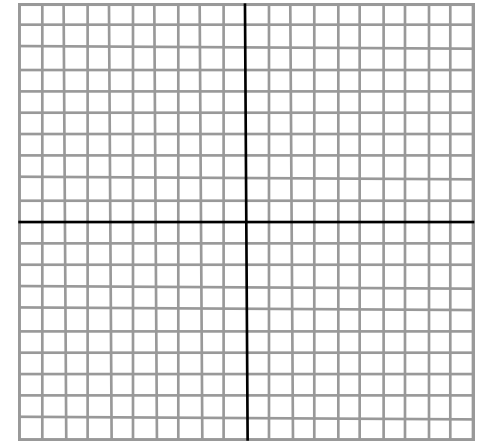
4A.  $f(x) = \frac{x^2 + 2x - 15}{x - 1}$



4B.  $f(x) = \frac{x - 2}{x^2 + x}$



4C.  $f(x) = \frac{3x^2 + x}{x^2 - 9}$



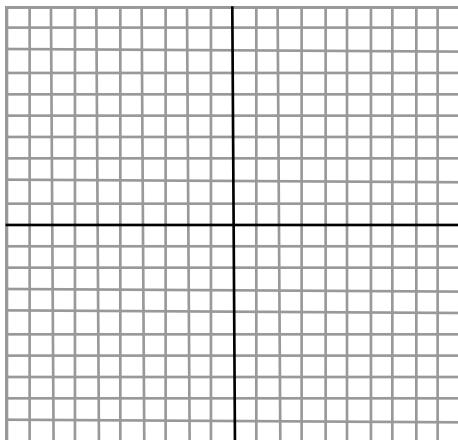
**Holes in Graphs**

If a rational function has the same factor  $x - b$  in both the numerator and the denominator, then

**Examples: Graphing Rational Functions with Holes.**

Identify holes in the graph. Then graph.

5A.  $f(x) = \frac{x^2 - 9}{x - 3}$



5B.  $f(x) = \frac{x^2 + x - 6}{x - 2}$

