Pre-Calculus – Unit 6 Name: _____

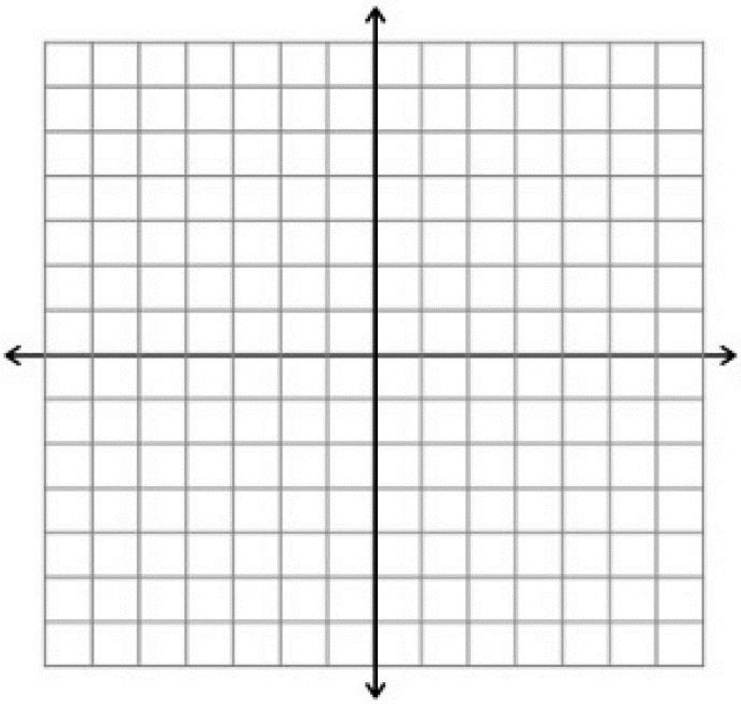
Polynomials and Rationals

6.1 Graphing Polynomials

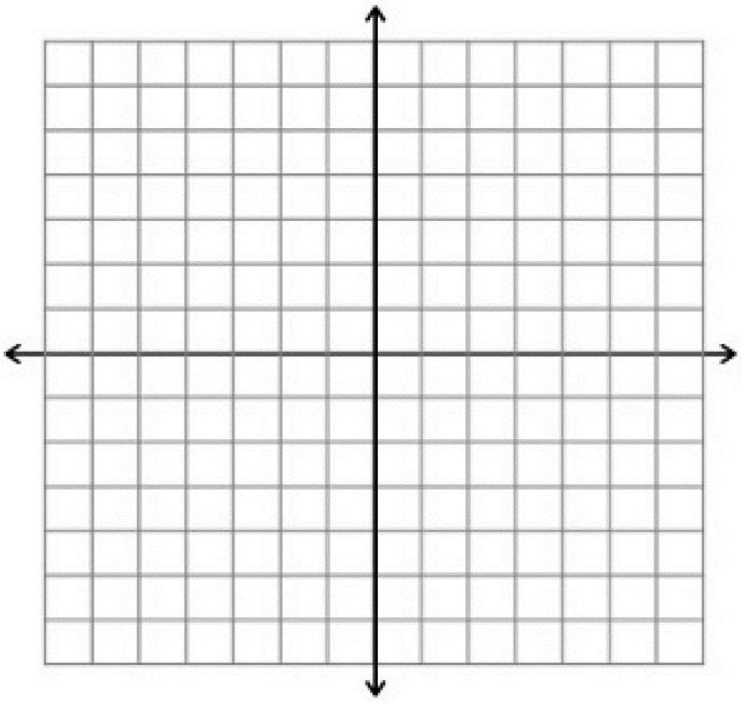
For each of the following functions:

a. Use the Leading Coefficient Test to determine the polynomial function's end behavior.
b. Find the x-intercepts by setting the function =0 and factoring.
c. Determine each solution's multiplicity and state if it touches the x-axis and turns around or crosses the x-axis.
d. Determine the y-intercept of each polynomial function.
e. Sketch the graph of the polynomial function.

1. $f(x) = -x^4 + 4x^2$
   a. End Behavior
   b. x-intercepts
   c. Multiplicity
   d. Y-intercept



2. $f(x) = x^3 + 2x^2 - x - 2$
   a. End Behavior
   b. x-intercepts
   c. Multiplicity
   d. Y-intercept

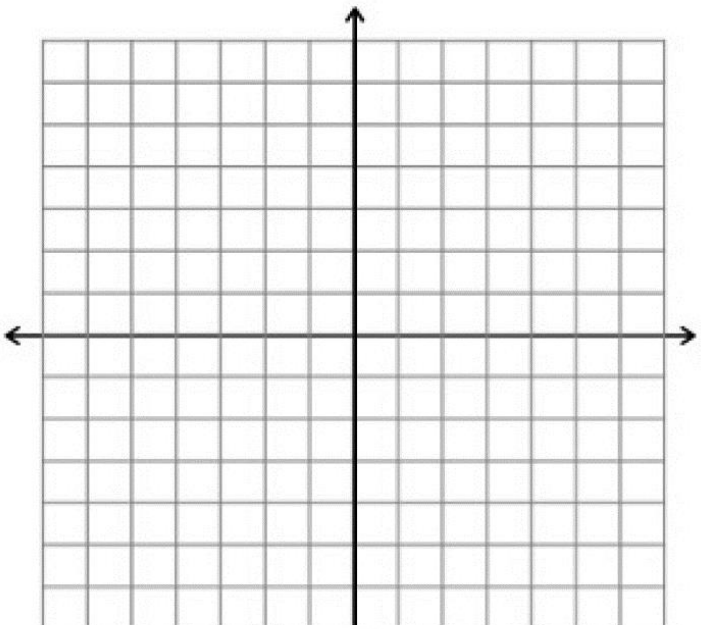


3. $f(x) = x^3 + x^2 - 4x - 4$
   a. End Behavior

   b. x-intercepts

   c. Multiplicity

   d. Y-intercept

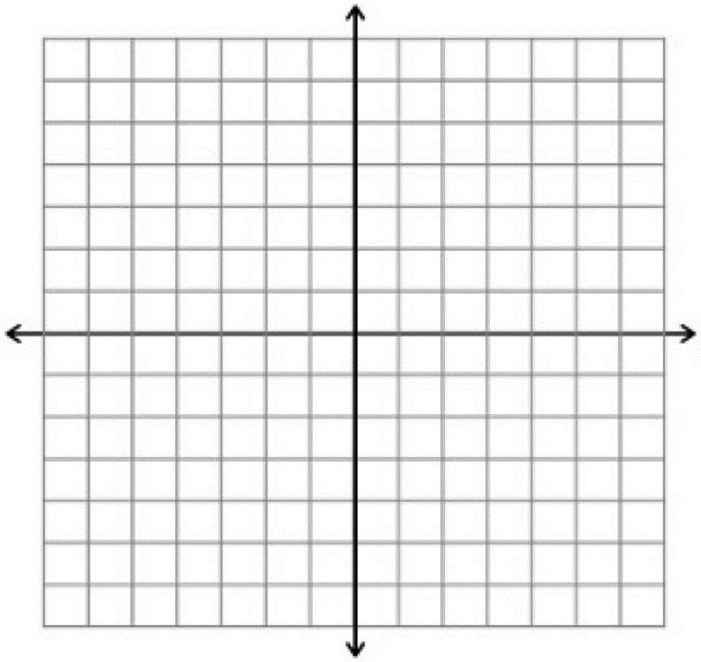


4. $f(x) = x^4 - 6x^3 + 9x^2$
   a. End Behavior

   b. x-intercepts

   c. Multiplicity

   d. Y-intercept

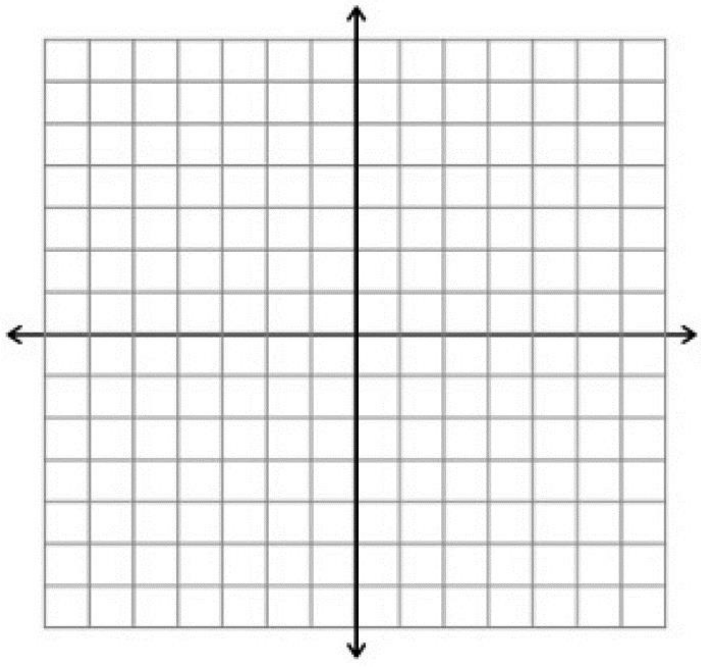


5. $f(x) = x^4 - 2x^3 + x^2$
   a. End Behavior

   b. x-intercepts

   c. Multiplicity

   d. Y-intercept



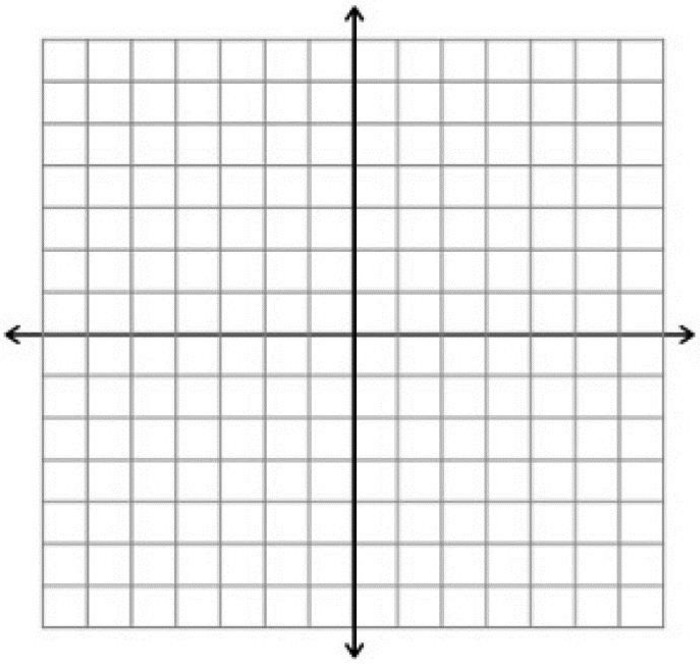
6.2 More Graphing Polynomials

1. $f(x) = -2x^4 + 4x^3$
   a. End Behavior

   b. x-intercepts

   c. Multiplicity

   d. Y-intercept

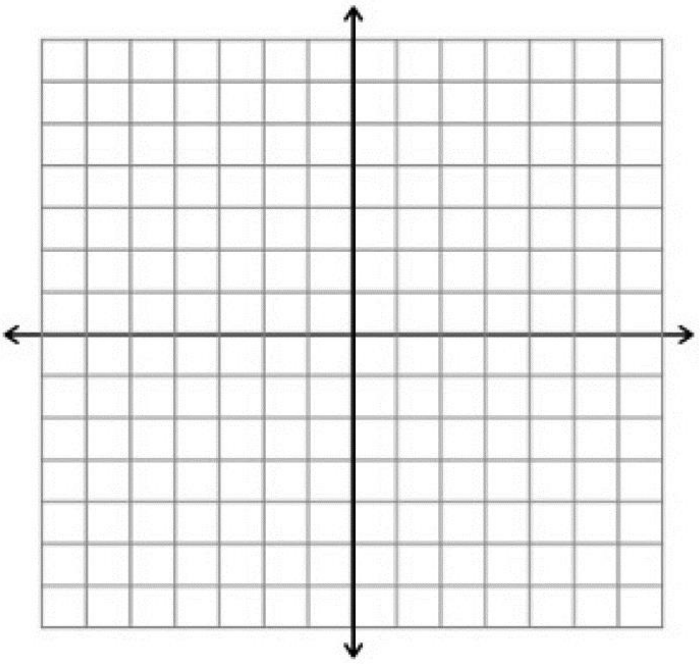


2. $f(x) = x^3 + x^2 - 5x + 3$
   a. End Behavior

   b. x-intercepts

   c. Multiplicity

   d. Y-intercept



3. Sketch the graph described and create a polynomial function with these characteristics.
   - The graph passes through the x-axis at $x = 0$.
   - The graph bounces on the x-axis at $x = -3$.
   - As $x \to \infty, f(x) \to -\infty$ and as $x \to -\infty, f(x) \to \infty$.

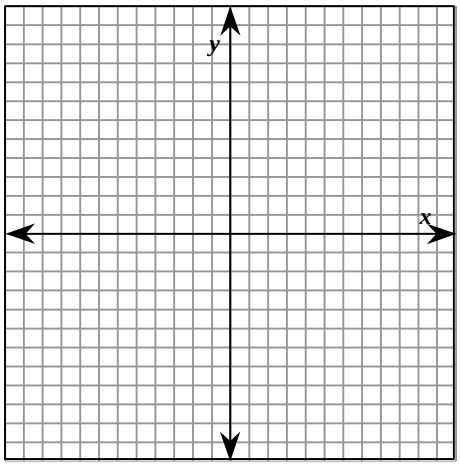
4. Sketch the graph described and create a polynomial function with these characteristics.
   - The graph passes through the x-axis at $x = 2$ and $x = -4$.
   - The graph bounces on the x-axis at $x = 1$.
   - As $x \to \infty, f(x) \to -\infty$ and as $x \to -\infty, f(x) \to -\infty$.

6.3 Graphing Rationals

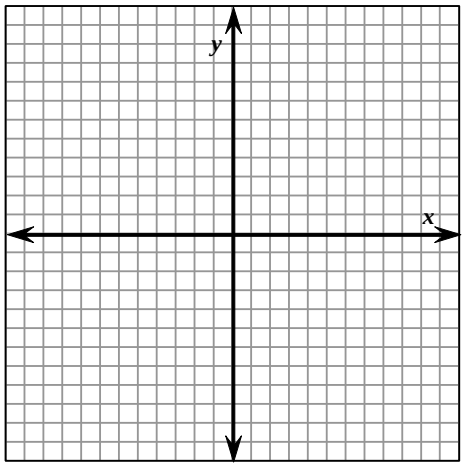
For each function below:

a. Find the values of x which must be excluded from the domain.
b. Find any holes, vertical, horizontal, and/or slant asymptotes.
c. Use intercepts, asymptotes, and other points to sketch the graphs.

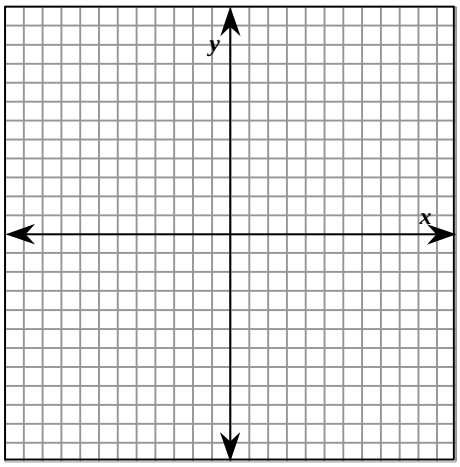
1. $f(x) = \frac{4}{x-5}$



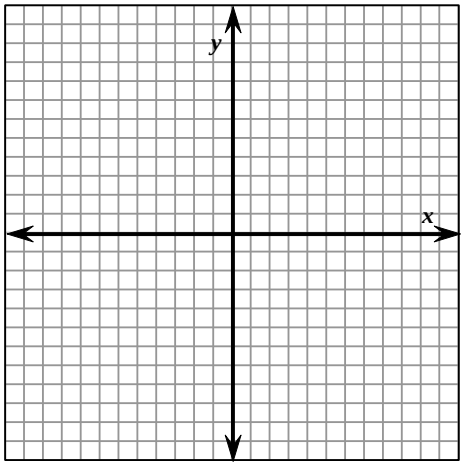
2. $f(x) = \frac{x-1}{x^2+3x-4}$



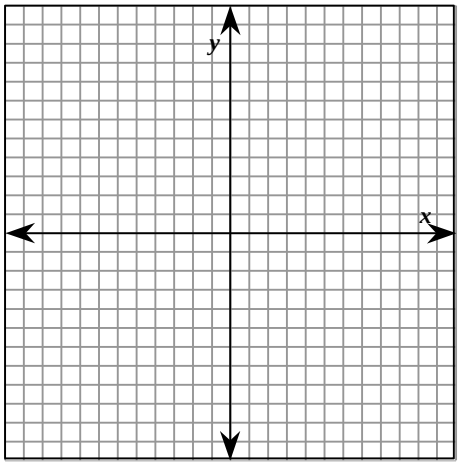
3. $f(x) = \frac{2}{x^2+3x-10}$



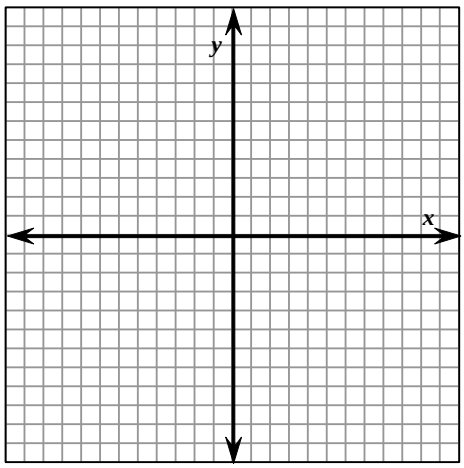
4. $f(x) = \frac{x^2-4x+3}{x^2-x-6}$



5. $f(x) = \frac{x^2+2x-15}{x-3}$



6. $f(x) = \frac{x^2-x-6}{x^2+3x+2}$

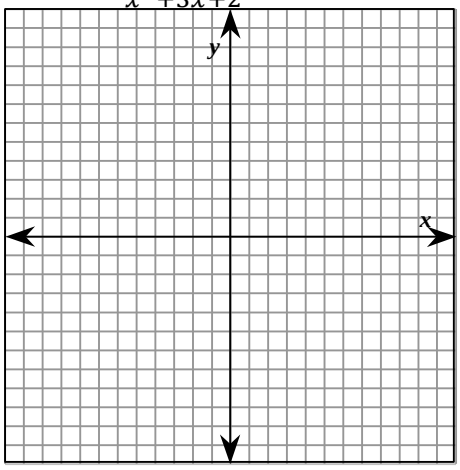


6.4 More Graphing Rationals

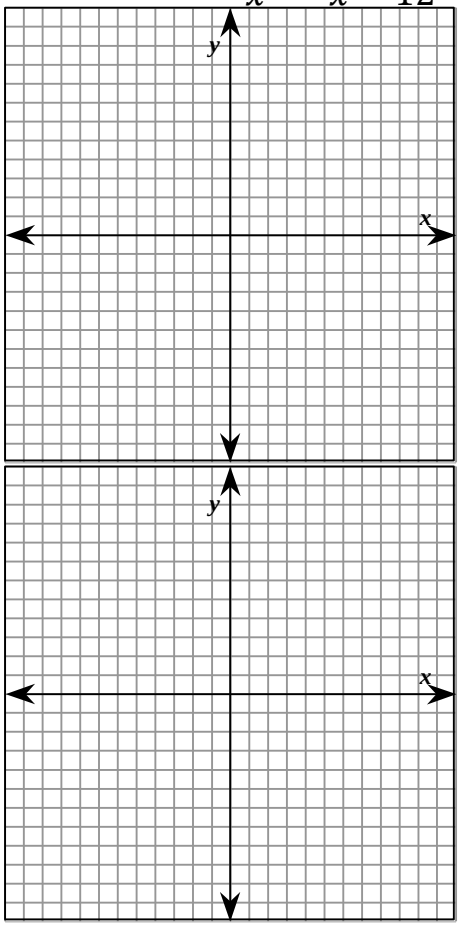
For each function below:

a. Find the values of x which must be excluded from the domain.
b. Find any holes, vertical, horizontal, and/or slant asymptotes.
c. Use intercepts, asymptotes, and other points to sketch the graphs.

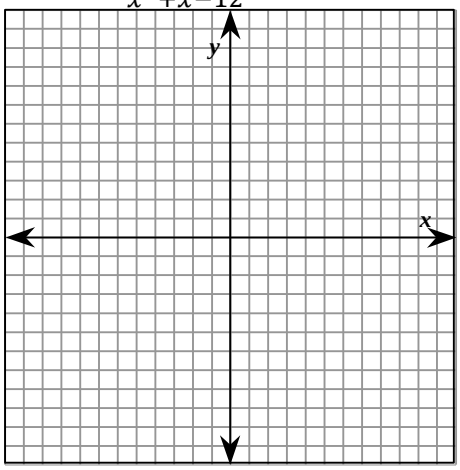
1) $f(x) = \frac{x-1}{x^2+3x+2}$



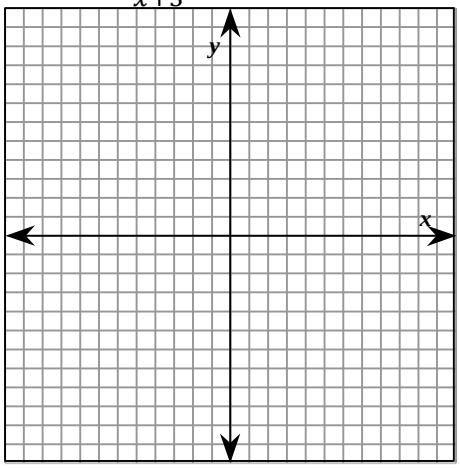
2) $h(x) = \frac{-2x^2+3x+2}{x^2-x-12}$



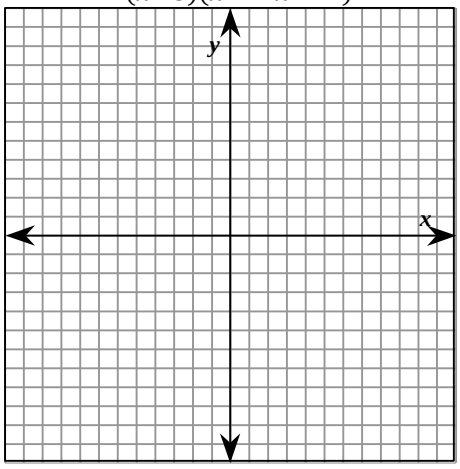
4) $g(x) = \frac{2x^2}{x^2+x-12}$



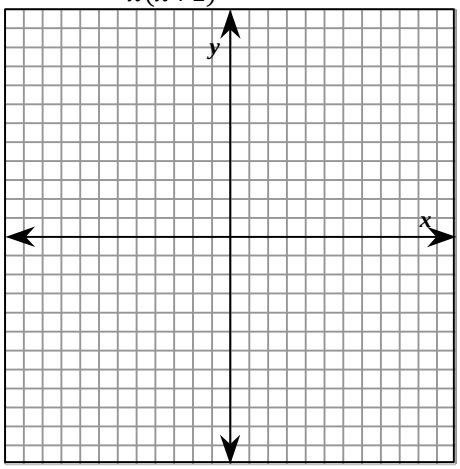
6) $f(x) = \frac{3x-2}{x+3}$



5) $p(x) = \frac{(x+8)(x-3)}{(x-5)(x^2+7x+12)}$



7) $g(x) = \frac{1}{x(x+1)^2}$



8) Write the equation of the rational function having these characteristics.
   a) vertical asymptotes at x = 4 and x = -1
   b) x intercepts at (3, 0), (-2, 0)
   c) horizontal asymptote at y = 2/3
   d) y intercept at (0, 1)

9) Divide using long division: $(3x^3 + 4x - 1)/ (x^2 + 1)$

6.5 Polynomial and Rational Functions Review

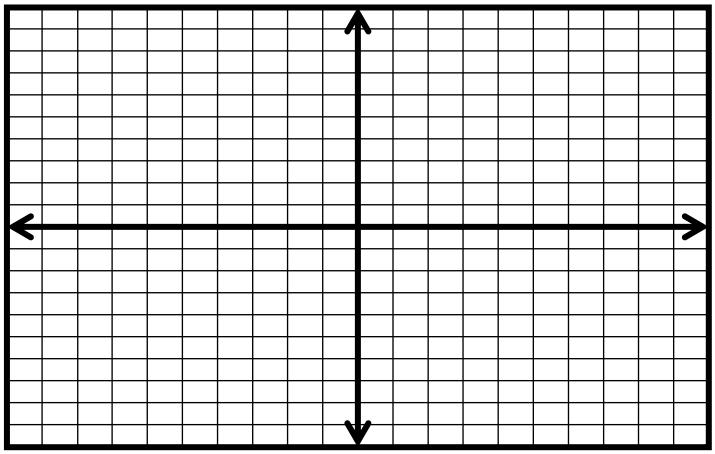
I. Given the following functions, answer the questions below. If none, write none.

R(x) = $\frac{x+1}{x(x-3)}$ P(x) = $\frac{x+1}{(x-1)^2}$ S(x) = $\frac{x^2-2x-15}{2(x+3)(x-1)}$ Q(x) = $\frac{x-7}{x^2-49}$

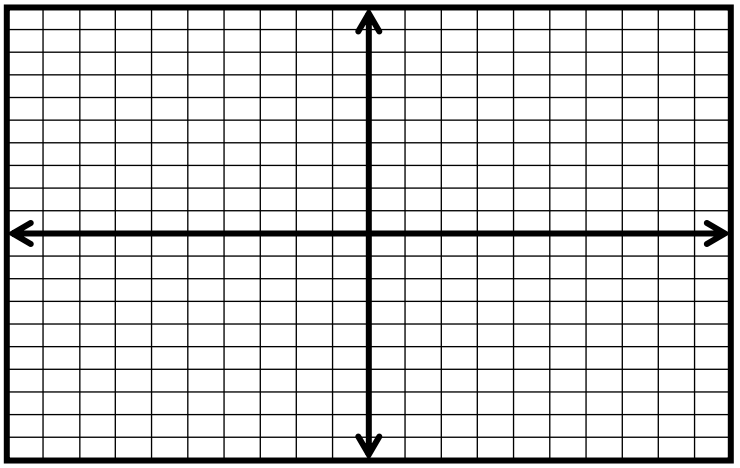
a. Which graph(s) has/have **two vertical asymptotes**? _____
b. Which graph(s) has/have a **hole**? _____
c. Which graph(s) has/have only **one x-intercept**? _____
d. Which graph(s) has/have a **horizontal asymptote at y = 0**? _____
e. Which graph has **two numbers excluded** from the **domain**? _____

II. Graph the following. Show all your work below. Make the graph neat. Clearly mark all points.

. R(x) = $\frac{x}{x+2}$

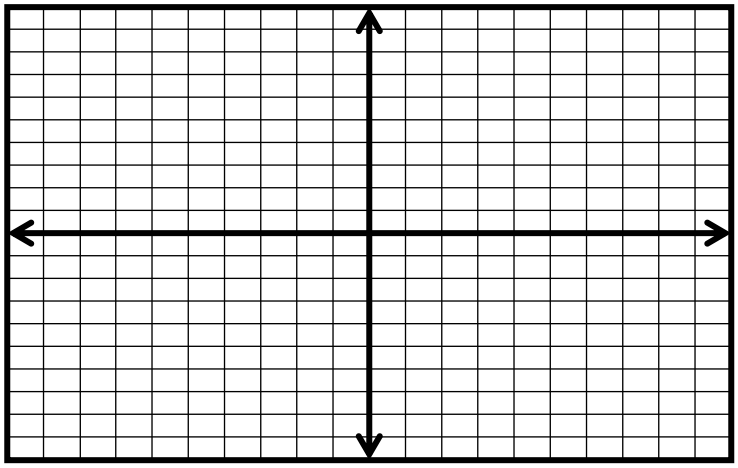


P(x) = $\frac{x-2}{x^2-12x+20}$

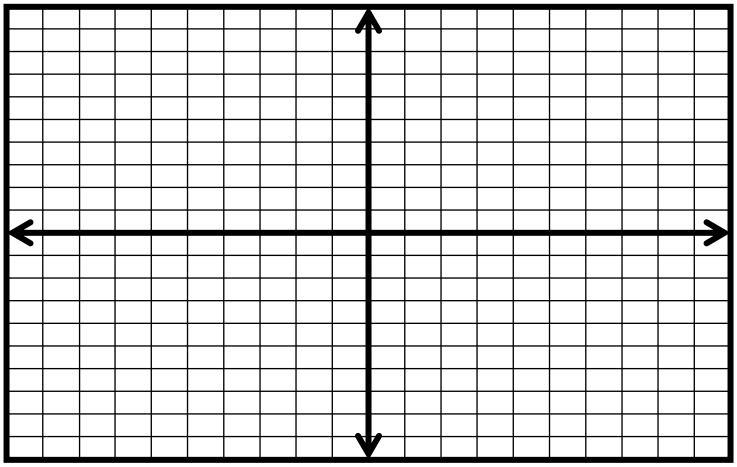


III. Graph each polynomial below:
a) Use the Leading Coefficient Test to determine the polynomial function's end behavior.
b) Find the x-intercepts by setting the function =0 and factoring.
c) Determine each soln's multiplicity and state if it turns around or crosses the x-axis.
d) Determine the y-intercept of each polynomial function.

$f(x) = x^4 - 2x^3 - 8x^2$



$f(x) = x^3 + 7x^2 - x - 7$



4. Describe the vertical asymptote(s) and hole(s) for the graph of $y = \frac{(x-5)(x-2)}{(x-2)(x+4)}$

5. Determine the horizontal asymptote of the graph of $y = \frac{6x^2 + 5x + 9}{7x^2 - x + 9}$

6. Write a polynomial function in standard form with zeros at -2 (multiplicity of 2), 3 (multiplicity of 1), and 4(multiplicity of 1) and also with a degree of 4.

7. Write a polynomial function in standard form with zeros at 6, –3, and 1 and also with a degree of 3.

Objective: Review Right Triangle Trig

8. From a sailboat, the angle of elevation to the top of a lighthouse 311 ft away is 17°. Find the height of the lighthouse.

9. A surveyor is standing 15 feet from the base of the Washington Monument. The surveyor measures the angle of elevation to the top of the monument as 78.3º. How tall is the Washington Monument?

State the quadrant in which θ lies.

10. $\sin\theta < 0$ and $\cos\theta < 0$

11. $\sin\theta > 0$ and $\tan\theta < 0$

12. $\sin\theta > 0$ and $\cos\theta > 0$

13. $\tan\theta < 0$ and $\sec\theta > 0$