## GRAPHING RATIONAL FUNCTIONS

To Identify Types of Discontinuity:

Step 1:   **HOLES (Removable Discontinuities)**
  ✓ Factor numerator & denominator
  ✓ Simplify
  ✓ If anything cancels, then there is a hole **(**More than one factor cancels → More than one hole)
  ✓ Find the ordered pair, (x, y), substitute x into the **SIMPLIFIED EQUATION** to get y

Step 2:   **VERTICAL ASYMPTOTES *(USE SIMPLIFIED EQUATION)***
  ✓ Set simplified equation denominator = 0, solve for x

Step 3:   **HORIZONTAL ASYMPTOTES – *Two Cases (USE SIMPLIFIED EQUATION)***
  ✓ Degree of Denominator = Degree of Numerator → y = ratio of leading coefficients
  ✓ Degree of Denominator > Degree of Numerator → $y = 0$

Step 4:   **SLANT ASYMPTOTES *(Exists only if Horizontal Asymptote is not present) (USE SIMPLIFIED EQUATION)***
  ✓ Degree of Numerator is **ONE** degree larger than the Degree of Denominator
  ✓ Use Long Division
  ✓ Ignore the remainder
  ✓ Answer in the form $y = mx + b$
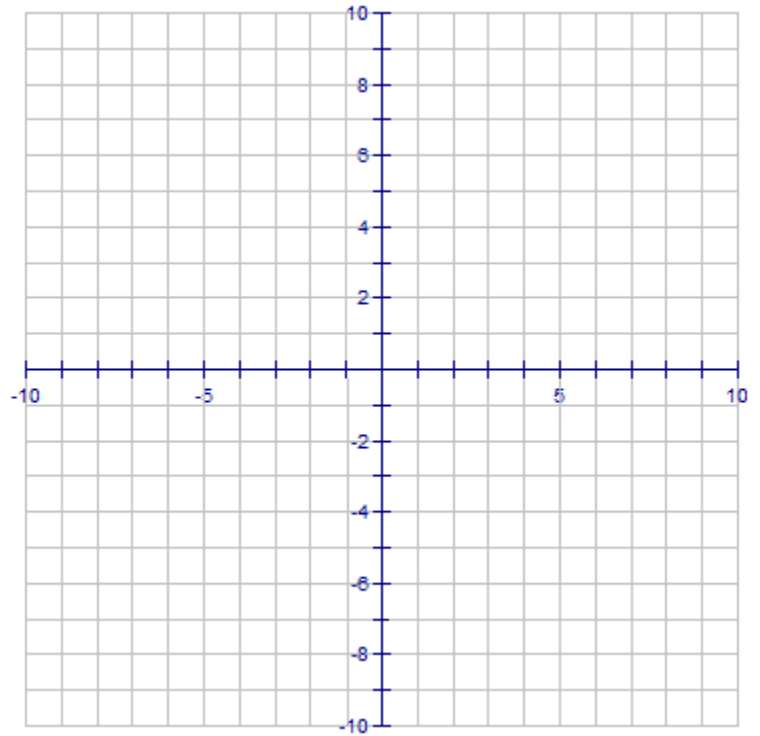
Directions: State each discontinuity, x-intercept, and y-intercept. Then sketch a graph.
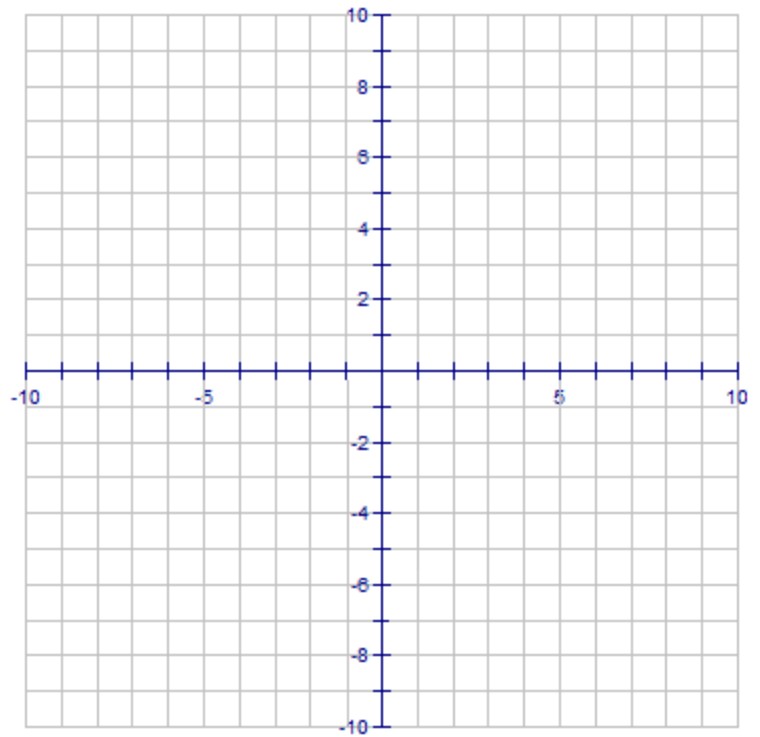
1.) $f(x) = \dfrac{x^2 - 4}{x - 2}$
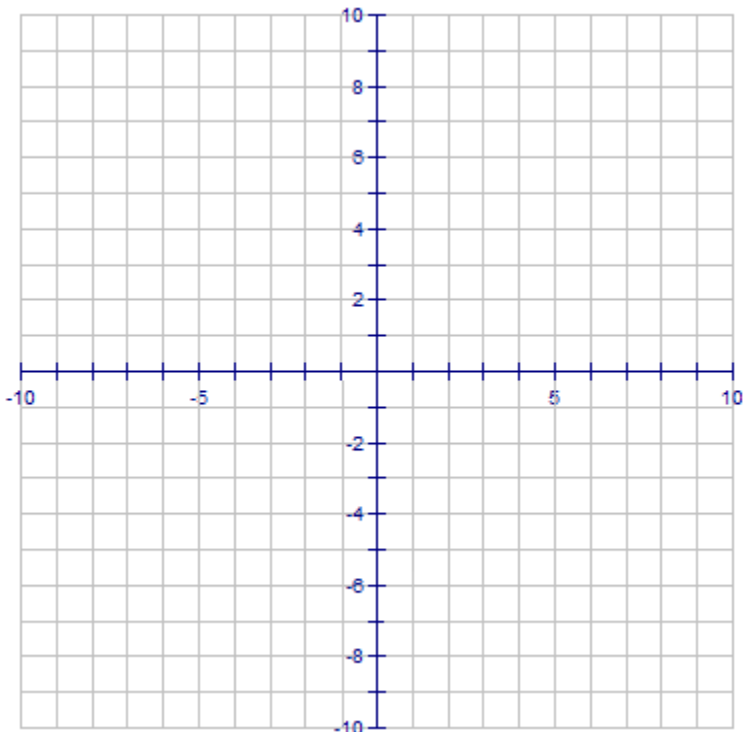
HOLE(S)	VERTICAL ASYMPTOTE(S)	HORIZONTAL ASYMPTOTE	SLANT ASYMPTOTE	x-intercept(s)	y-intercept

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

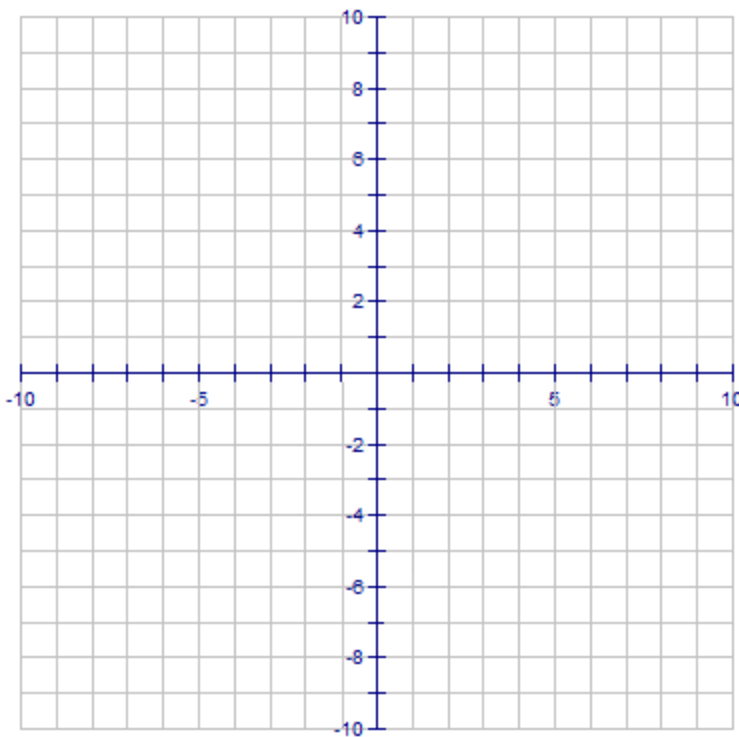| HOLE(S)	VERTICAL ASYMPTOTE(S)	HORIZONTAL ASYMPTOTE	SLANT ASYMPTOTE	x-intercept(s)	y-intercept

3.) $f(x) = \dfrac{-5}{x^2 - 2x - 3}$

HOLE(S)	VERTICAL ASYMPTOTE(S)	HORIZONTAL ASYMPTOTE	SLANT ASYMPTOTE	x-intercept(s)	y-intercept

4.) $f(x) = \dfrac{x^3+4x^2-21x}{x^2+4x-21}$
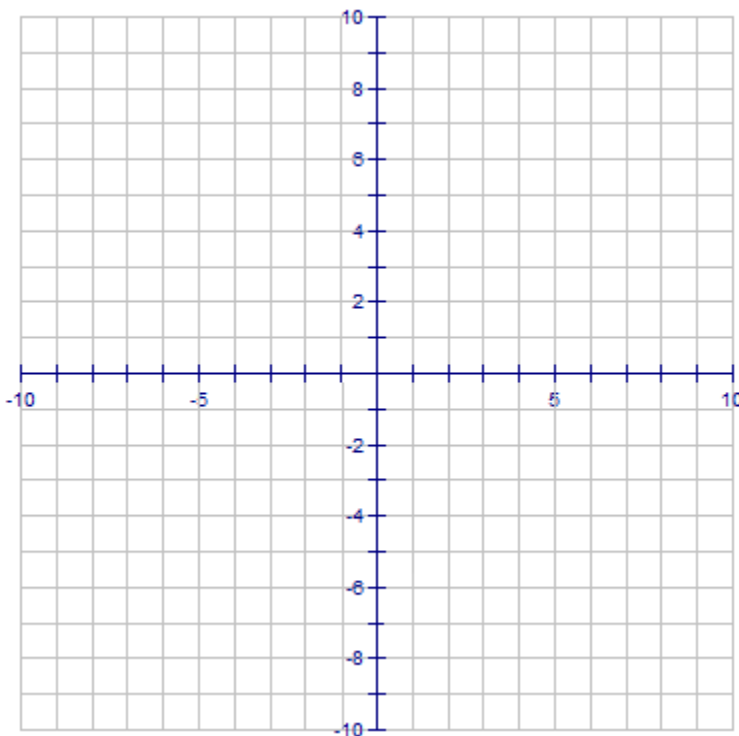
HOLE(S)	VERTICAL ASYMPTOTE(S)	HORIZONTAL ASYMPTOTE	SLANT ASYMPTOTE	x-intercept(s)	y-intercept

5.) $f(x) = \dfrac{x^2+5x+8}{x+3}$

HOLE(S)	VERTICAL ASYMPTOTE(S)	HORIZONTAL ASYMPTOTE	SLANT ASYMPTOTE	x-intercept(s)	y-intercept

6.) $f(x) = \dfrac{x^2+x-2}{(x+2)(x^2-2x-15)}$
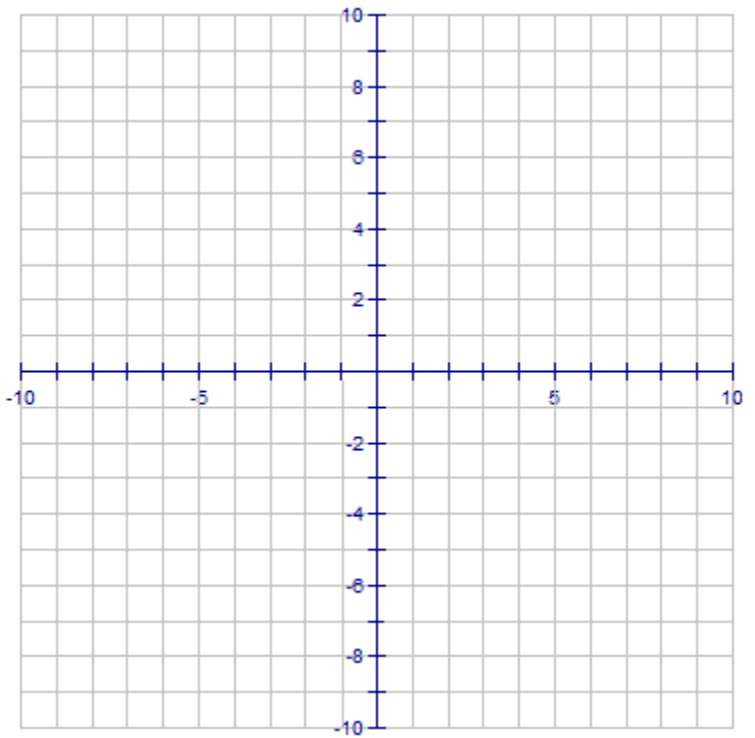
HOLE(S)	VERTICAL ASYMPTOTE(S)	HORIZONTAL ASYMPTOTE	SLANT ASYMPTOTE	x-intercept(s)	y-intercept

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

HOLE(S)	VERTICAL ASYMPTOTE(S)	HORIZONTAL ASYMPTOTE	SLANT ASYMPTOTE	x-intercept(s)	y-intercept