Graphing Rational Functions:

Discontinuities – Where are there breaks in the graph? (These are limitations to the domain.) Discontinuities are caused by the denominator being equal to zero. (Remember, we can NEVER divide by zero!) Use FACTORED FORM

- **Non-Removable Discontinuities** (Vertical Asymptotes) – These are the zeroes of the denominator that can NOT be canceled with anything in the numerator. Vertical Asymptotes should be listed as the equations of a line, such as $x = -3$, or $x = 6$.
- **Removable Discontinuities** (Holes) – These are the zeroes of the denominator that cancel with a factor of the numerator. You first find the x-value of the hole, then substitute that back into the canceled equation, to find the y-value of the hole. Holes should be listed as points (x, y)

Y-Intercepts – Where does the graph cross the y-axis? Simply make $x = 0$, and simplify. In standard form, it ends up being the constant of the numerator over the constant from the denominator. REMEMBER: If $x = 0$ is a discontinuity, then there is NO y-intercept.

X-Intercepts- What values make $y = 0$? – This comes from setting the numerator equal to zero. (Remember, discontinuities can't be x-intercepts either, so don't include holes.

Horizontal/Slant Asymptotes- What happens as x approaches ∞ and -∞?

$$f(x) = \frac{ax^n + \cdots}{bx^m + \cdots}$$

- If $n < m$, then we have a horizontal asymptote at $y = 0$.
- If $n = m$, then there is a horizontal asymptote at $y = a/b$
- If $n > m$, then, we have a slant asymptote.