Graphing Rational Functions

❶ Always FACTOR and cancel first	
❷ x value at hole	x from cancelled factor(s)
❸ y value at hole	Plug hole's x value into "REDUCED FUNCTION"
❹ vertical asymptote (VA)	x from remaining factor(s) in **denominator**
❺ x-intercept	x from remaining factor(s) in **numerator**
❻ y-intercept	Plug 0 into x in "REDUCED FUNCTION"
❼ end behavior asymptote (EBA)	Is x "bigger" in numerator or denominator? (see examples at bottom)

Example:

❶ factor and cancel

$$f(x) = \frac{x^2 - x - 20}{x^2 + 5x + 4} \rightarrow \frac{\cancel{(x+4)}(x-5)}{\cancel{(x+4)}(x+1)} \rightarrow \boxed{\text{"REDUCED FUNCTION"}\ \frac{(x-5)}{(x+1)}}$$

❷ & ❸ hole at (-4, **3**)

$$\boxed{\frac{(\mathbf{-4} - 5)}{(\mathbf{-4} + 1)} = \mathbf{3}}$$

❹ VA : **x = -1**

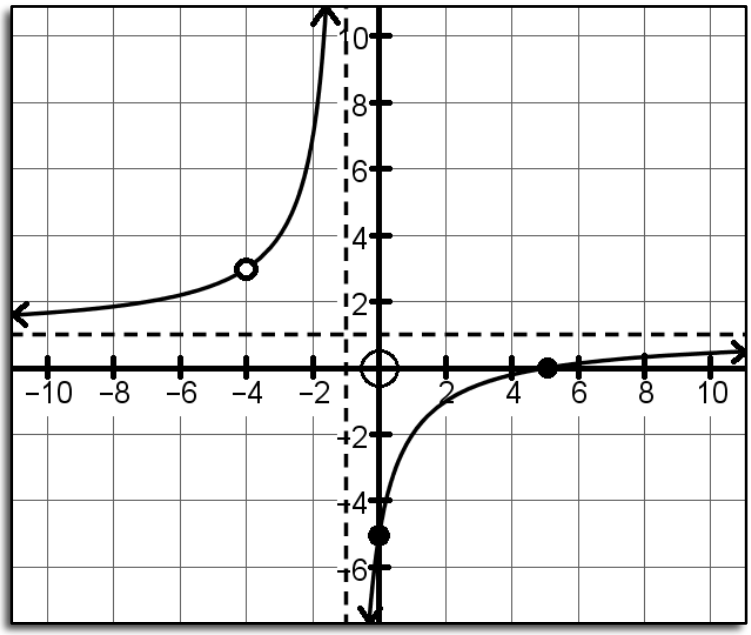
❺ x-intercept: (5, 0)

❻ y-intercept: (0, **-5**)

$$\boxed{\frac{(\mathbf{0} - 5)}{(\mathbf{0} + 1)} = \mathbf{-5}}$$

❼ EBA: **y = 1**

$$\boxed{\frac{(\mathbf{x} - 5)}{(\mathbf{x} + 1)} = \mathbf{1}}$$



← END BEHAVIOR ASYMPTOTE (EBA) EXAMPLES →

$$\frac{x^2 + 1}{x^2 + 7}$$ EBA: Y = 1

$$\frac{2x + 1}{x + 7}$$ EBA: Y = 2

$$\frac{x + 1}{2x + 7}$$ EBA: Y = 1/2

$$\frac{x + 1}{x^2 + 7}$$ EBA: Y = 0