

# Steps for Rational Functions Graphs

# GRAPHING RATIONAL FUNCTIONS

① Always FACTOR and cancel first *This creates a hole*

② x value at hole	x from <u>cancelled</u> factor(s)
③ y value at hole	Plug hole's x value into "REDUCED FUNCTION"
④ vertical asymptote (VA)	x from <u>remaining</u> factor(s) in <b>denominator</b>
⑤ x-intercept	x from <u>remaining</u> factor(s) in <b>numerator</b>
⑥ y-intercept	Plug 0 into x in "REDUCED FUNCTION"
⑦ end behavior asymptote (EBA) <i>Horizontal or Slant Asymptote</i>	Is x "bigger" in numerator or denominator? (see examples at bottom)

Example:

① factor and cancel

"REDUCED FUNCTION"

$$f(x) = \frac{x^2 - x - 20}{x^2 + 5x + 4} \rightarrow \frac{(x+4)(x-5)}{(x+4)(x+1)} \rightarrow \frac{(x-5)}{(x+1)}$$

② & ③ hole at (-4, 3)

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

④ VA:  $x = -1$

⑤ x-intercept: (5, 0)

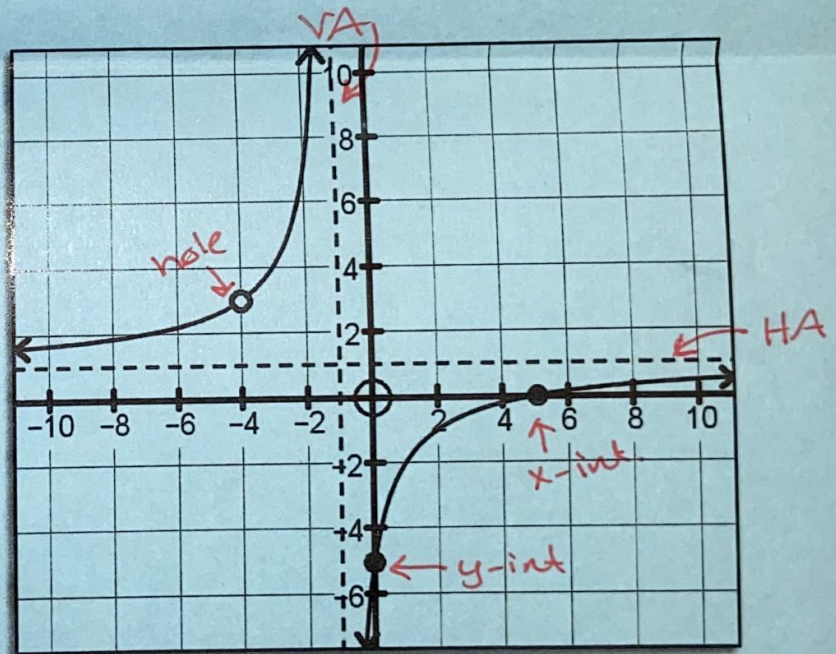
⑥ y-intercept: (0, -5)

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

⑦ EBA:  $y = 1$

*HA*

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



*Horizontal*  
← 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:  $Y = 0$