

*Section 2.7*

*Graphs of Rational Functions*

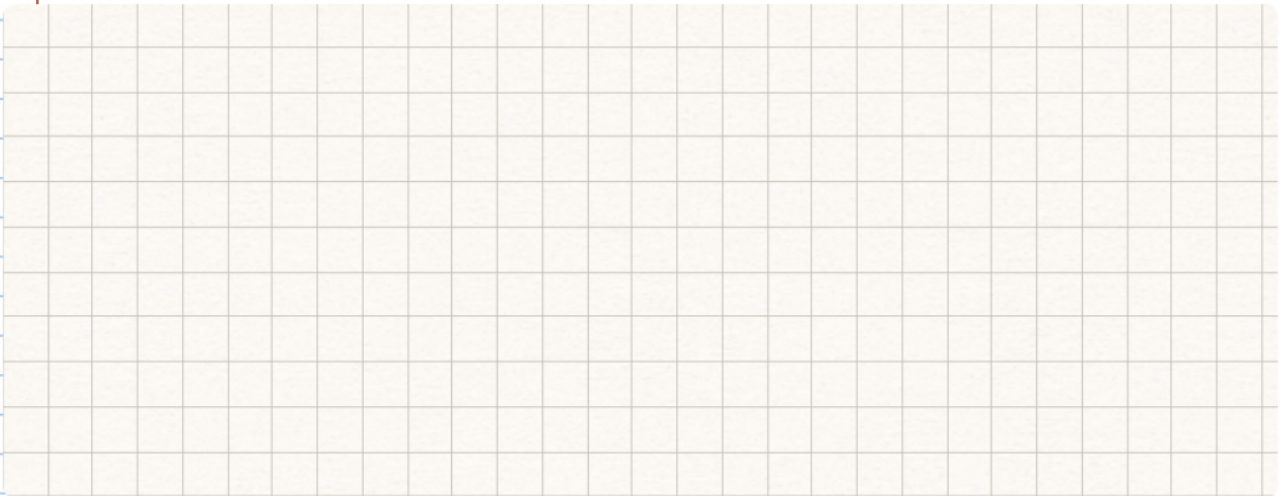
**Objective**

Given a rational function students will be able to sketch its graph.

***Study Problems***

***Part 1 Page 204 #15,21,23,25,27***

***Part 2 Page 204 #47-53 odd, 84-86***



# Guidelines for Graphing Rational Functions

Let  $f(x) = N(x)/D(x)$ , where  $N(x)$  and  $D(x)$  are polynomials with no common factors.

1. Find and plot the y-intercept (if any) by evaluating  $f(0)$ .
2. Set the numerator equal to zero and solve the equation  $N(x) = 0$ . The real solutions represent the x-intercepts of the graph. Plot these intercepts.
3. Set the denominator equal to zero and solve the equation  $D(x) = 0$ . The real solutions represent the vertical asymptotes. Sketch these asymptotes using dashed vertical lines.
4. Find and sketch the horizontal asymptote of the graph using a dashed horizontal line.
5. Plot at least one point between and one point beyond each x-intercept and vertical asymptote.
6. Use smooth curves to complete the graph between and beyond the vertical asymptotes.

Example  $k(x) = \frac{x^2 - 2x - 3}{x + 2}$  →  $x + 2 \neq 0$   
 $x \neq -2$

a) find the domain  $\mathbb{D}: \{x \in \mathbb{R} \mid x \neq -2\}$

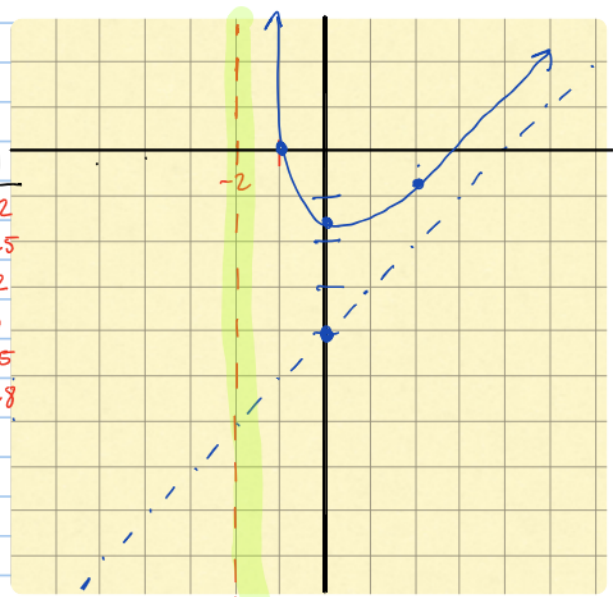
b) Identify the horizontal (Deg. num > Deg. Den) asymptote None, b/c slant Asy.

c) Identify the vertical asymptote  $x = -2$

d) x and y intercepts

$0 = x^2 - 2x - 3$	$y\text{-int } (x=0)$
$0 = (x-3)(x+1)$	$y = -\frac{3}{2}$
$(3, 0), (-1, 0)$	$(0, -\frac{3}{2})$

e) Sketch its graph



Justify your response

use a graphing calculator to verify your results

$$\begin{array}{r} -2 \mid 1 \ -2 \ -3 \\ \downarrow -2 \ 8 \\ 1 \ -4 \ 5 \end{array}$$

$y = \frac{1}{1}x - 4$   
 slant Asy  
 $m = \frac{1}{1}$

Example

Sketch the graph of the rational function

$$m(x) = \frac{x^2 - 25}{x - 5} = \frac{(x+5)\cancel{(x-5)}}{\cancel{(x-5)}} = \frac{x+5}{1} \quad \leftarrow \text{line}$$

Horiz Asy = None

Vertical Asy  
 $x=5$  of  
undefined  
point

