1. Describe the effects of changes to the *C*-value and *D*-value on each characteristic given.

$$r(x) = A\left(\frac{1}{B(x - C)}\right) + D$$

a. Domain

b. Range

c. End behavior

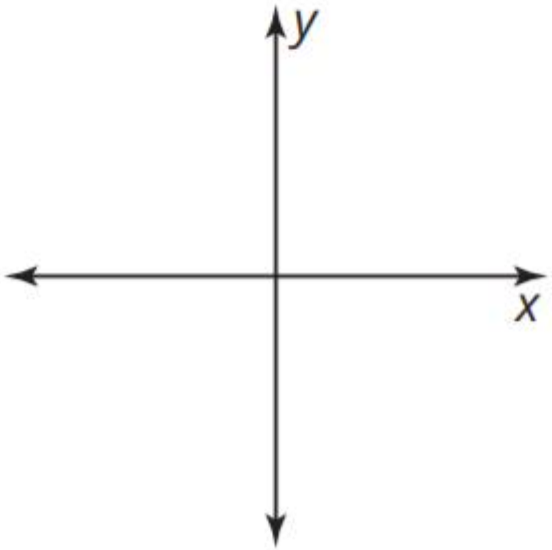
Rational functions are any functions of the form $f(x) = \frac{P(x)}{Q(x)}$ where $P(x)$ and $Q(x)$ are polynomial functions, and $Q(x) \neq 0$.

2. What determines a vertical asymptote? When does a rational function have more than one vertical asymptote?

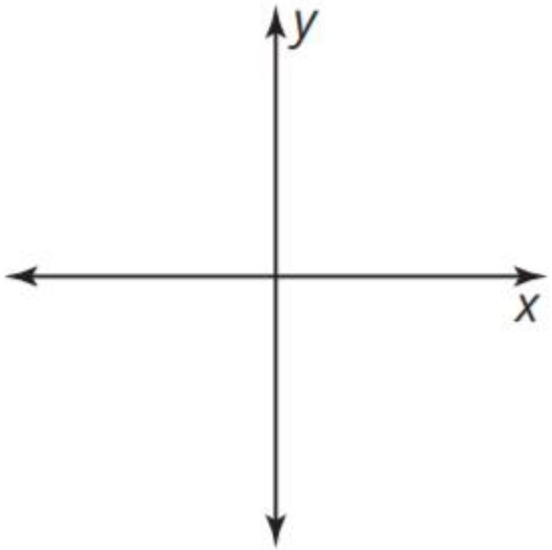
Rational functions are any functions of the form $f(x) = \frac{P(x)}{Q(x)}$ where $P(x)$ and $Q(x)$ are polynomial functions, and $Q(x) \neq 0$.

3. **Given $f(x) = \frac{1}{x}$, sketch each transformation and explain your process.**

a. $g(x) = f(x) + 5$

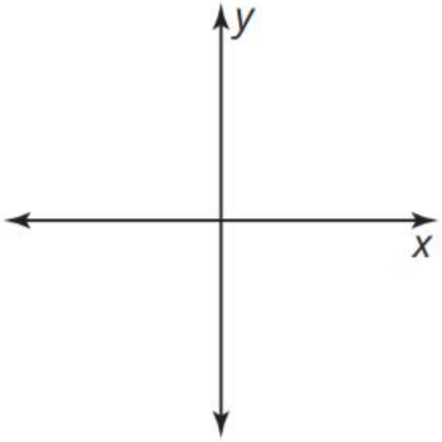


b. $h(x) = f(x + 5)$



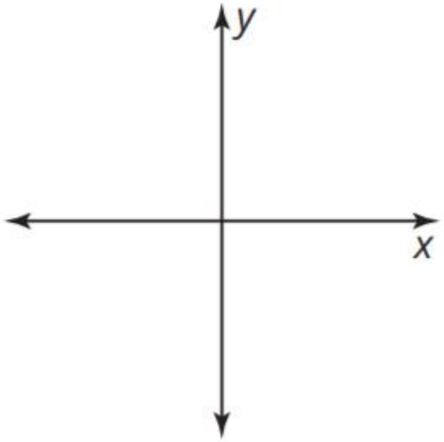
4. **Write a rational function $g(x)$ that matches the given characteristics. Then sketch the function.**

a. **Vertical asymptote at $x = 2$**
Horizontal asymptote at $y = 1$



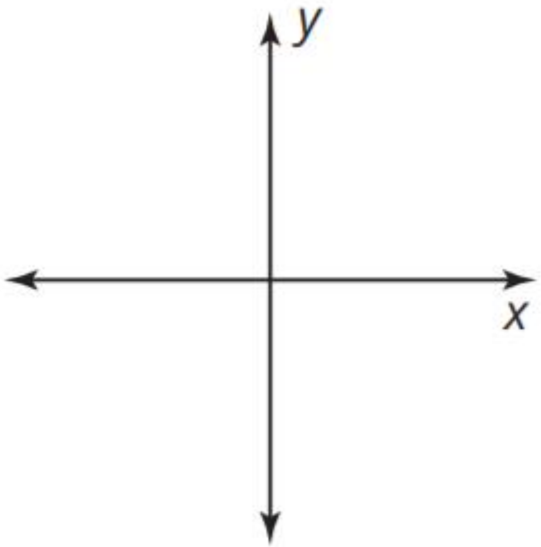
$g(x) =$

b. **Vertical asymptote at $x = 1$, $x = -5$**
Horizontal asymptote at $y = -3$



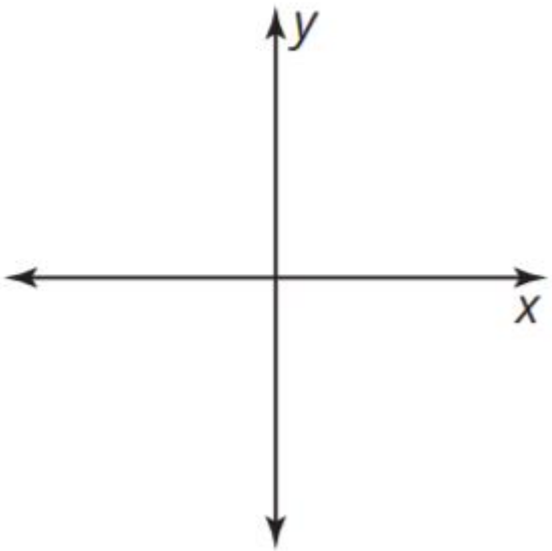
$g(x) =$

c. For $f(x) = \frac{1}{x}$, $g(x) = f(x - 2) - 4$



$g(x) =$

d. For $f(x) = \frac{1}{x}$, $g(x)$ shifts $f(x)$ up and to the left.



$g(x) =$

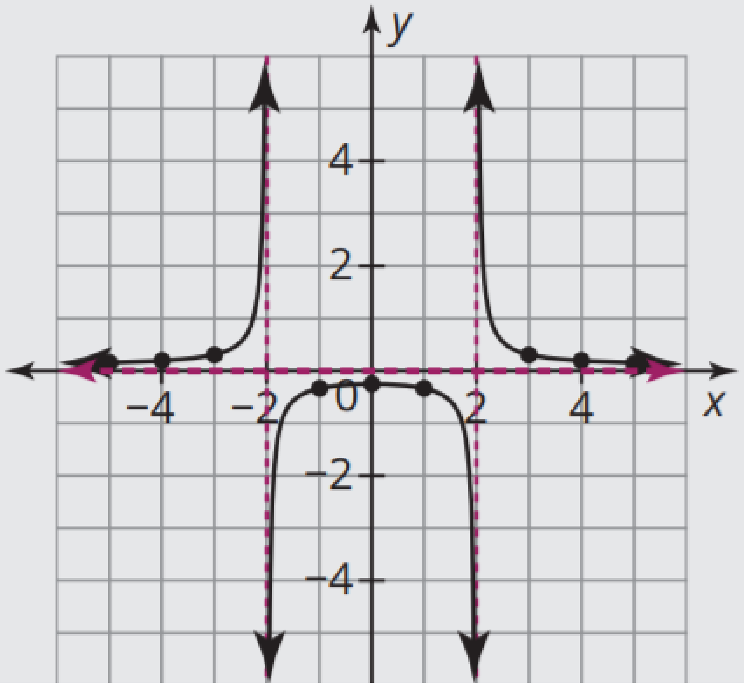
1. Analyze the methods Jodi and Theresa each used to graph the rational function $j(x) = \frac{1}{x^2 - 4}$.

Jodi

I created a table and plotted the points.

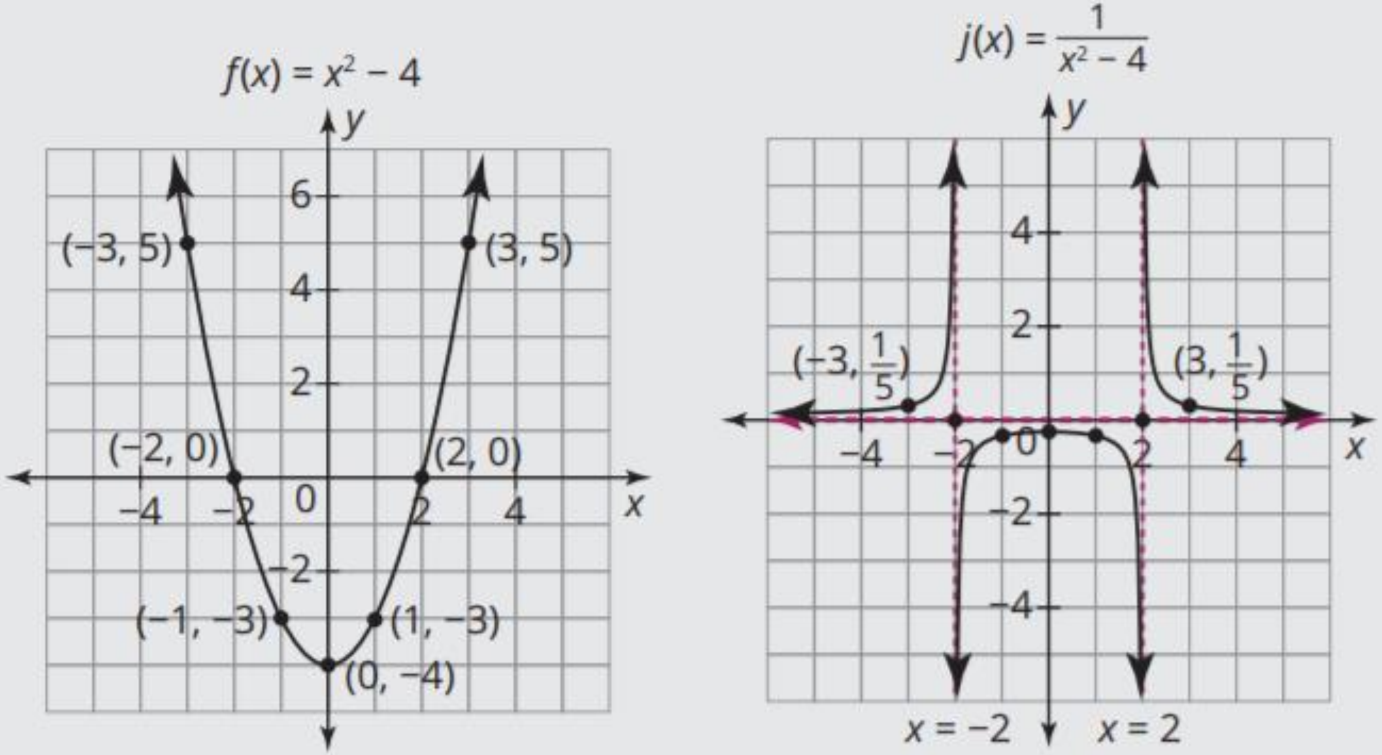
-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6
$\frac{1}{32}$	$\frac{1}{21}$	$\frac{1}{12}$	$\frac{1}{5}$	undefined	$-\frac{1}{3}$	$-\frac{1}{4}$	$-\frac{1}{3}$	undefined	$\frac{1}{5}$	$\frac{1}{12}$	$\frac{1}{21}$	$\frac{1}{32}$

I see that vertical asymptotes occur at $x = -2$ and $x = 2$, where the denominator is 0 and the output is undefined.



Theresa

I graphed the function f(x) = x^2 − 4. The function j(x) is the reciprocal of f(x), so I took the reciprocal of several key points and sketched the graph.



The zeros of the function $f(x) = x^2 - 4$ are $(-2, 0)$ and $(2, 0)$ that become asymptotes at $x = -2$ and $x = 2$ in the function $j(x) = \frac{1}{x^2 - 4}$. The y-intercept shifts from $(0, -4)$ in $f(x)$ to $\left(0, \frac{-1}{4}\right)$ in $j(x)$. By plotting a couple key points and recognizing that a horizontal asymptote is at $y = 0$, I can sketch the function.

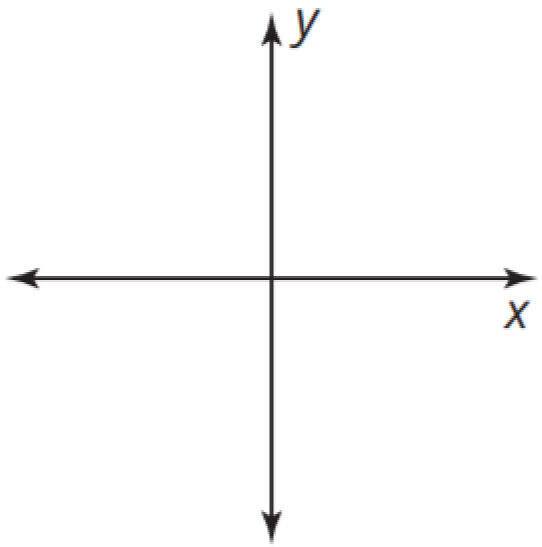
a. Which method do you think is most efficient? Explain your reasoning.

b. Which method do you think is the most accurate? Explain your reasoning.

c. How does a vertical asymptote affect the domain of a function?

2. **Without technology, sketch each function and then identify the key characteristics.**

a. $g(x) = \dfrac{1}{(x-2)(x+4)}$



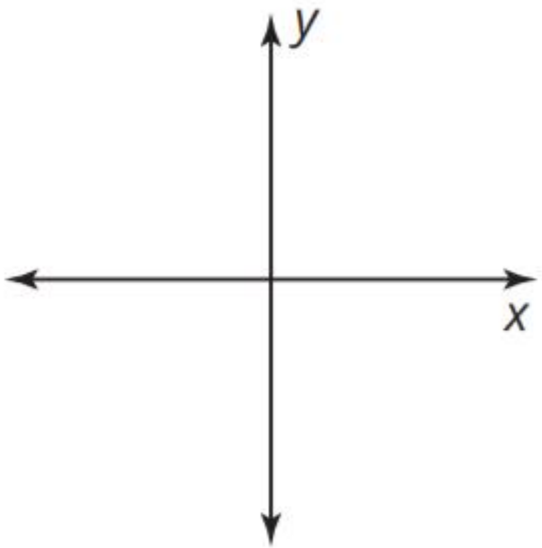
Domain:

Asymptote(s):

Range:

***y*-intercept:**

b. $g(x) = \frac{2}{x^2 - 2x - 8}$



Domain:

Asymptote(s):

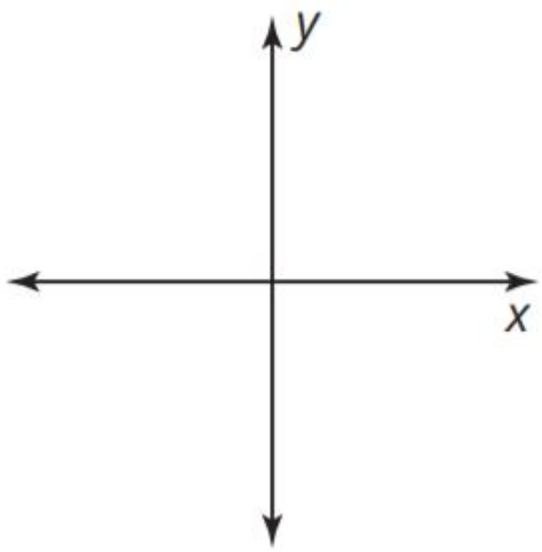
Range:

***y*-intercept:**

c. $h(x) = \dfrac{1}{x^2 + 3x - 10}$

Domain:

Asymptote(s):



Range:

***y*-intercept:**