

**Key Concepts**

- Inverse Variation Word Problems ( $y=k/x$ )
- Sketching the graph of Rational Functions
- Finding Vertical Asymptotes, Horizontal Asymptotes, Holes, Domain, Range
- Simplifying Rational Expressions
- Multiplying Rational Expressions
- Dividing Rational Expressions
- Adding and Subtracting Rational Expressions with...
  - Common Denominators
  - Uncommon Denominators
- Solving Rational Equations
  - ...By Cross Multiplying
  - ...By finding the LCM
  - Checking for Extraneous Solutions

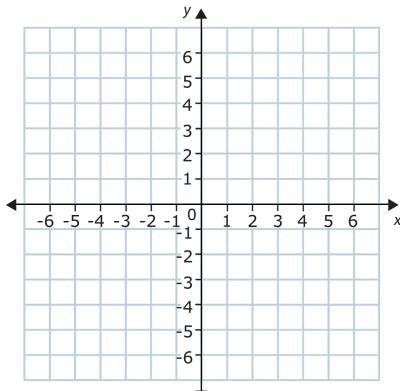
**Discussion**

1. In your own words, define the following:
  - a. Inverse Variation
  - b. Rational Expression
  - c. Asymptote
  - d. Hole
  - e. Domain
  - f. Range
  - g. Extraneous Solution
  - h. LCM
2. Describe how you would find a...
  - a. Vertical Asymptote
  - b. Horizontal Asymptote
  - c. Hole
3. Can an x-value give you both a hole and a vertical asymptote?
4. Describe the process you would do to divide rational expressions.

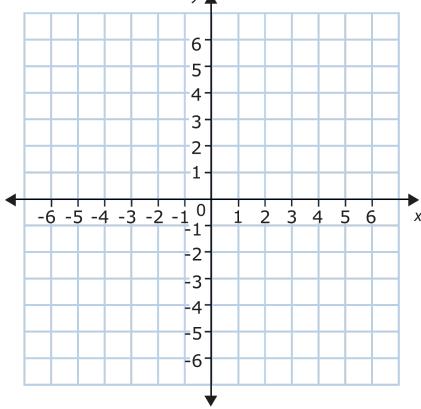
## Practice

5. The length of a violin string varies inversely as the frequency of its vibrations. A violin string 14 inches long vibrates at a frequency of 450 cycles per second. Find the frequency of a 12-inch violin string.
6. Sketch a graph of the following:

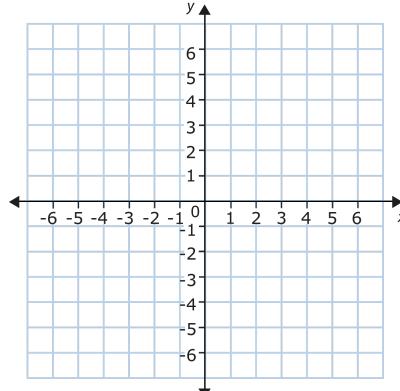
a.  $y = \frac{4}{x-5} + 2$



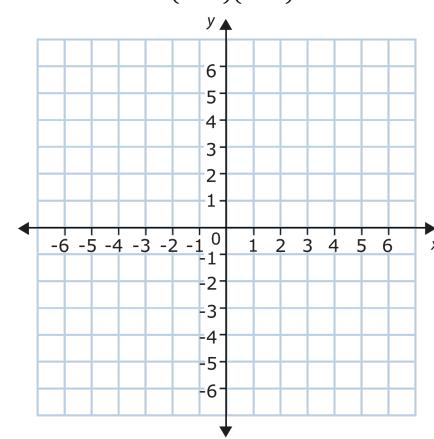
b.  $y = \frac{9}{x+5}$



c.  $y = \frac{(x-5)}{(x+2)(x-5)}$



d.  $y = \frac{(x+7)(x-3)}{(x-2)(x+3)}$



7. Simplify the following Rational Expressions

a.  $\frac{9x^2 + 81x}{x^3 + 8x^2 - 9x}$

b.  $\frac{x^2 + 2x - 80}{2x^3 - 24x^2 + 64x}$

c.  $\frac{3r^2 - 39r + 90}{r^2 - 3r - 70}$

8. For the following Rational Functions, identify any Holes and Vertical and Horizontal Asymptotes. If none exist, write n/a. Then identify the Domain and the Range.

a.  $y = \frac{3x^2+21x}{x^2+5x-14}$

Hole(s)	
VA	
HA	
Domain	
Range	

b.  $y = \frac{x-3}{2x^2+15x+27}$

Hole(s)	
VA	
HA	
Domain	
Range	

c.  $y = \frac{x^2-9x+20}{4x^2-12x-40}$

Hole(s)	
VA	
HA	
Domain	
Range	

d.  $y = \frac{x+7}{(3x-2)(x+7)}$

Hole(s)	
VA	
HA	
Domain	
Range	

9. Perform the Operations below:

a.  $\frac{1}{p-9} \cdot \frac{p^2+6p-27}{p+9}$

e.  $\frac{2x}{3x+3} - \frac{2}{x+5}$

b.  $\frac{v-7}{v+6} \cdot \frac{10v+60}{v-7}$

f.  $\frac{3}{x+7} + \frac{4}{x-8}$

c.  $\frac{16x-56}{8} \div \frac{8x-28}{4}$

g.  $\frac{r+6}{3r-6} + \frac{r+1}{3r-6}$

d.  $\frac{a-4}{a^2-2a-8} \div \frac{1}{a-5}$

h.  $\frac{x+y}{18xy} - \frac{6x+y}{18xy}$

**10. Solve the following equations:**

$$\mathbf{h)} \frac{2}{x+2} - \frac{1}{x} = \frac{-4}{x(x+2)}$$

$$\mathbf{a)} \frac{1}{5x} = \frac{1}{9x}$$

$$\mathbf{i)} \frac{3}{x+5} + \frac{2}{5-x} = \frac{-4}{x^2-25}$$

$$\mathbf{b)} \frac{4}{2x-3} = \frac{x}{5}$$

$$\mathbf{j)} \frac{10}{2y+8} - \frac{7y+8}{y^2-16} = \frac{-8}{2y-8}$$

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$$\mathbf{c)} \frac{3}{2x} - \frac{5}{3x} = 2$$

$$\mathbf{d)} \frac{1}{2} \leq \frac{1}{x+3} + \frac{1}{x}$$

$$\mathbf{e)} \frac{3}{x} = \frac{12}{x+7}$$

$$\mathbf{f)} \frac{2}{y} + \frac{1}{2} = \frac{5}{2y}$$

$$\mathbf{g)} \frac{10}{6x+7} = \frac{6}{2x+9}$$