

11.1 – Inverse Variation

<p>Direct Variation:</p> <p>Ex:</p> <p>Equation:</p>	<p>Inverse Variation:</p> <p>Ex:</p> <p>Equation:</p>
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Example: State whether each is a direct or inverse variation.

1) Hours worked and earnings	2) Speed of a car and time to complete a journey.	3) Distance from Sun and gravitational strength.
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<p>If $y = 2x$, what happens to y as x increases?</p> <table style="border-collapse: collapse;"> <tr> <td style="border-right: 1px solid black; padding: 2px 5px;">x</td> <td style="padding: 2px 5px;">2</td> <td style="padding: 2px 5px;">4</td> <td style="padding: 2px 5px;">6</td> <td style="padding: 2px 5px;">8</td> </tr> <tr> <td style="border-right: 1px solid black; padding: 2px 5px;">y</td> <td colspan="4" style="border-top: 1px solid black;"></td> </tr> </table>	x	2	4	6	8	y					<p>If $y = \frac{2}{x}$, what happens to y as x increases?</p> <table style="border-collapse: collapse;"> <tr> <td style="border-right: 1px solid black; padding: 2px 5px;">x</td> <td style="padding: 2px 5px;">2</td> <td style="padding: 2px 5px;">4</td> <td style="padding: 2px 5px;">6</td> <td style="padding: 2px 5px;">8</td> </tr> <tr> <td style="border-right: 1px solid black; padding: 2px 5px;">y</td> <td colspan="4" style="border-top: 1px solid black;"></td> </tr> </table>	x	2	4	6	8	y				
x	2	4	6	8																	
y																					
x	2	4	6	8																	
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Example: State whether each is a direct or inverse relationship and write the equation.

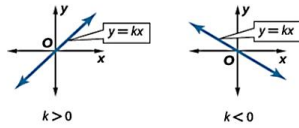
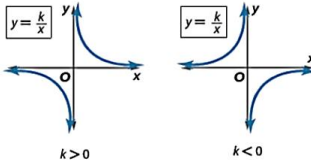
<table border="1" style="margin: auto;"> <thead> <tr style="background-color: #0070c0; color: white;"> <th>x</th> <th>y</th> </tr> </thead> <tbody> <tr><td>1</td><td>16</td></tr> <tr><td>2</td><td>8</td></tr> <tr><td>4</td><td>4</td></tr> </tbody> </table>	x	y	1	16	2	8	4	4	<table border="1" style="margin: auto;"> <thead> <tr style="background-color: #0070c0; color: white;"> <th>x</th> <th>y</th> </tr> </thead> <tbody> <tr><td>1</td><td>3</td></tr> <tr><td>2</td><td>6</td></tr> <tr><td>3</td><td>9</td></tr> </tbody> </table>	x	y	1	3	2	6	3	9
x	y																
1	16																
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$xy = 5$	$-2x = y$																

Example: Write and solve a direct or inverse equation.

<p>1) If it takes 7 machines 3 hours to manufacture a set number of pieces, how long will it take 10 machines operating at the same pace?</p>	<p>2) Nicole earns \$25.50 babysitting for 3 hours. How much will she earn for 7 hours?</p>
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You can also solve these by setting up proportions.

- 1)
- 2)

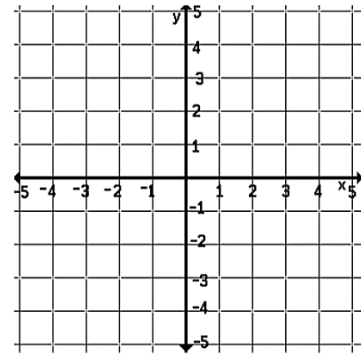
Direct Variation	Inverse Variation
 <p style="text-align: center;">$k > 0$ $k < 0$</p>	 <p style="text-align: center;">$k > 0$ $k < 0$</p>
<ul style="list-style-type: none"> • $y = kx$ • y varies directly as x. 	<ul style="list-style-type: none"> • $y = \frac{k}{x}$ • y varies inversely as x.

11.2 – Rational Functions

KeyConcept Rational Functions	
Words	A rational function can be described by an equation of the form $y = \frac{p}{q}$, where p and q are polynomials and $q \neq 0$.
	Parent function: $f(x) = \frac{1}{x}$
	Type of graph: hyperbola
	Domain: $\{x x \neq 0\}$
	Range: $\{y y \neq 0\}$

x	y
-2	
-1	
-1/2	
-1/4	
0	
1/4	
1/2	
1	
2	

Lead-In: Graph the parent function $y = \frac{1}{x}$



Excluded Values:

Example: State the excluded values.

$y = \frac{5}{3x-18}$	$y = \frac{2}{x^2-2x-8}$
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General Form of a Rational Function

$y = \frac{a}{x-b} + c$ State the effect of each: a: _____ b: _____ c: _____

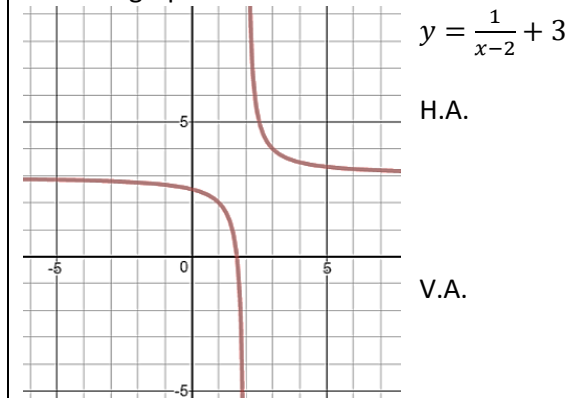
Asymptote:

Horizontal Asymptote:

Vertical Asymptote:

Words	A rational function in the form $y = \frac{a}{x-b} + c$, $a \neq 0$, has a vertical asymptote at the x -value that makes the denominator equal zero, $x = b$. It has a horizontal asymptote at $y = c$.	
Model		Example
		$y = \frac{1}{x-2} + 1$

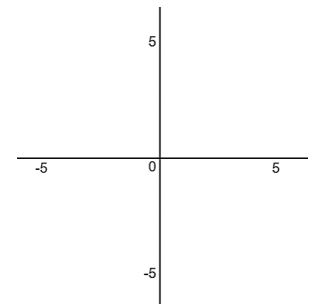
State the horizontal and vertical asymptote of the function graphed below.



State the asymptotes, graph the function and state the domain and range.

$$y = \frac{1}{x+2} - 1$$

1) Sketch V.A. and H.A.



2) Use calculator to sketch the graph.

Domain: _____

Range: _____

11.3 – Simplify Rational Expressions

Rational Expression:

Example: Simplify and state excluded values.

$\frac{(-3x^2)(5x^7)}{9x^3}$	$\frac{2x^2-12x}{x-6}$
$\frac{2x+18}{x^2+8x-9}$	

$\frac{36-x^2}{5x-30}$

Zeros:

Example: Find the zeros of each (note: first simplify).

$\frac{x^2+2x-15}{x+1}$	$\frac{x^2+3x-18}{x-3}$
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11.4 and 11.7 – Multiply and Divide Rational Expressions and Complex Fractions

$\frac{r^2x}{9t^3} \cdot \frac{3t^4}{rx}$	$\frac{4}{15n^3} \div \frac{12}{25n}$
$\frac{\frac{8t^2}{x}}{\frac{4t}{x^3}}$	<p>A scarf bought in Italy cost 18 Euros. The exchange rate at the time was \$1 = 0.73 E.</p> <p>a) How much did the scarf cost in US dollars?</p> <p>b) If at the same time, 1 Canadian dollar = \$0.95 US, how much did the scarf cost in Canadian dollars?</p>

Before simplifying rational expressions with polynomials, you should _____ first.

$$\frac{2x+6}{x^2} \div (x+3)$$

$$\frac{\frac{n^2 + 7n - 18}{n^2 - 2n + 1}}{\frac{n^2 - 81}{n - 1}}$$

11.5 – Dividing Polynomials

Example: Polynomial divided by a monomial

$$(2x^2 + 16x) \div 2x$$

$$(9x^5 - 5x^2 - 12) \div 3x$$

Example: Polynomial divided by a binomial

$$(x^2 - 2x - 15) \div (x + 3)$$

What if we try to factor the following expression shown below? What else can we do?

$$(x^2 + 4x + 12) \div (x + 3)$$

Verify our answer is correct:

Example: Long Division with Missing Terms

$$(2x^3 + 2x^2 - 4) \div (x - 1)$$

11.6/11.7 – Add/Subtract Rational and Mixed Expressions

Example: Add or subtract expressions with a common denominator

$\frac{3y}{3+y} + \frac{y^2}{3+y}$	$\frac{2h+4}{h+1} - \frac{5+h}{h+1}$	$\frac{3p}{p-4} + \frac{2p-5}{4-p}$
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Example: Add or subtract expressions with an uncommon denominator

$\frac{3x+2}{x^2-2x-3} + \frac{x+1}{x-3}$	$\frac{6x}{4x+8} + 5x$
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