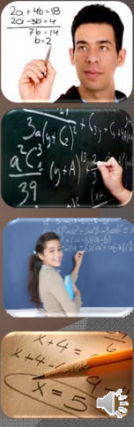
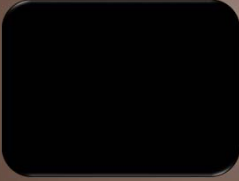


Algebra 1

Graphing Rational Functions



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Rational Functions

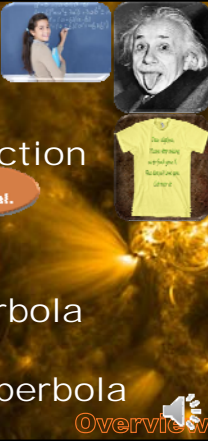
Parent Rational Function

Get Real. Be Rational.

Hyperbola π $\sqrt{-1}$

Branches of a Hyperbola

Asymptotes of a Hyperbola

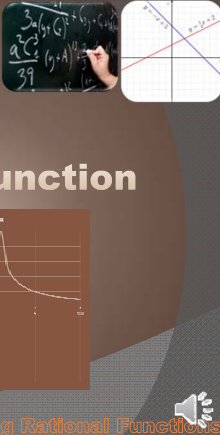
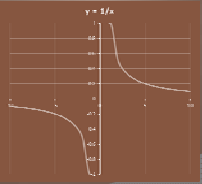


Overview

Rational Function

$$y = \frac{a}{x-h} + k$$

Parent Rational Function

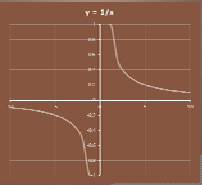
$$y = \frac{1}{x}$$


Graphing Rational Functions

Rational Function

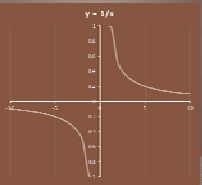
$$y = \frac{a}{x-h} + k$$

Parent Rational Function

$$y = \frac{1}{x}$$


Graphing Rational Functions

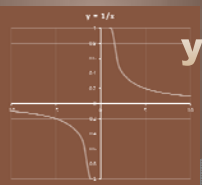
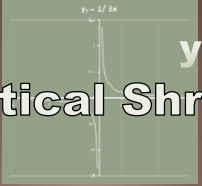
hyperbola
branches of hyperbola
asymptotes of hyperbola

$$y = \frac{1}{x}$$


Graphing Rational Functions

Vertical Shrink

$$y = \frac{1}{3x}$$

$$y = \frac{1}{x}$$



x	y	x	y
-10	-0.1	10	0.0333
-9	-0.111	9	0.037
-8	-0.125	8	0.042
-7	-0.143	7	0.048
-6	-0.167	6	0.056
-5	-0.2	5	0.067
-4	-0.25	4	0.0833
-3	-0.333	3	0.111
-2	-0.5	2	0.167
-1	-1	1	0.333
0	#DIV/0!	0	#DIV/0!
1	1	1	0.3333
2	0.5	2	0.1667
3	0.3333	3	0.1111
4	0.25	4	0.0833
5	0.2	5	0.0667
6	0.1667	6	0.0556
7	0.1429	7	0.0476
8	0.125	8	0.0417
9	0.1111	9	0.037
10	0.1	10	0.0333

Graphing Rational Functions

$y = \frac{a}{x-h} + k$

**Vertical Stretch
Reflection**

$y = \frac{-3}{x}$

$y = \frac{1}{x}$

x	y	x	y
-10	-0.1	10	0.3
-9	-0.111	9	0.3333
-8	-0.125	8	0.375
-7	-0.143	7	0.4286
-6	-0.167	6	0.5
-5	-0.2	5	0.6
-4	-0.25	4	0.75
-3	-0.333	3	1
-2	-0.5	2	1.5
-1	-1	1	3
0	#DIV/0!	0	#DIV/0!
1	1	1	1
2	0.5	2	1.5
3	0.3333	3	1
4	0.25	4	0.75
5	0.2	5	0.6
6	0.1667	6	0.5
7	0.1429	7	0.429
8	0.125	8	0.375
9	0.1111	9	0.333
10	0.1	10	0.3

Graphing Rational Functions

$y = \frac{a}{x-h} + k$

**Horizontal Asymptote:
 $y = k$**

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

$y = \frac{1}{x}$

x	y	x	y
-10	1.9	10	1.8889
-9	1.875	9	1.875
-8	1.8571	8	1.8571
-7	1.8571	7	1.8571
-6	1.8571	6	1.8571
-5	1.8571	5	1.8571
-4	1.8571	4	1.8571
-3	1.8571	3	1.8571
-2	1.8571	2	1.8571
-1	1.8571	1	1.8571
0	#DIV/0!	0	#DIV/0!
1	1.8571	1	1.8571
2	1.8571	2	1.8571
3	1.8571	3	1.8571
4	1.8571	4	1.8571
5	1.8571	5	1.8571
6	1.8571	6	1.8571
7	1.8571	7	1.8571
8	1.8571	8	1.8571
9	1.8571	9	1.8571
10	1.8571	10	1.8571

Graphing Rational Functions

$y = \frac{a}{x-h} + k$

**Vertical Asymptote:
 $x = h$**

$y = \frac{1}{x-3}$

$y = \frac{1}{x}$

x	y	x	y
-10	-0.077	10	-0.077
-9	-0.083	9	-0.083
-8	-0.091	8	-0.091
-7	-0.1	7	-0.1
-6	-0.107	6	-0.107
-5	-0.117	5	-0.117
-4	-0.125	4	-0.125
-3	-0.133	3	-0.133
-2	-0.143	2	-0.143
-1	-0.154	1	-0.154
0	-0.167	0	-0.167
1	-0.182	1	-0.182
2	-0.2	2	-0.2
3	-0.225	3	-0.225
4	-0.25	4	-0.25
5	-0.273	5	-0.273
6	-0.3	6	-0.3
7	-0.324	7	-0.324
8	-0.347	8	-0.347
9	-0.364	9	-0.364
10	-0.375	10	-0.375

Graphing Rational Functions

$y = \frac{a}{x-h} + k$

If Different from the Value in the Parent Function, $y = \frac{1}{x}$

coefficient of $x \rightarrow$ vertical shrink

$a \rightarrow$ vertical stretch; reflection

$k \rightarrow$ moves horizontal asymptote up or down

$h \rightarrow$ moves vertical asymptote left or right

Graphing Rational Functions

coefficient of $x \rightarrow$ vertical shrink
 $a \rightarrow$ vertical stretch; reflection
 $k \rightarrow$ moves horizontal asymptote up or down
 $h \rightarrow$ moves vertical asymptote left or right

$y = \frac{a}{x-h} + k$

Graph
 $y = \frac{3}{x+1} + 4$

x	y
-3	2.5
-2	1
-1.5	-2
-1	#DIV/0!
0	7
1	5.5
2	5

Graphing Rational Functions

coefficient of $x \rightarrow$ vertical shrink
 $a \rightarrow$ vertical stretch; reflection
 $k \rightarrow$ moves horizontal asymptote up or down
 $h \rightarrow$ moves vertical asymptote left or right

$y = \frac{a}{x-h} + k$

Graph
 $y = \frac{-1}{x-2} - 2.5$

You Try It

coefficient of $x \rightarrow$ vertical shrink
 $a \rightarrow$ vertical stretch; reflection
 $k \rightarrow$ move horizontal asymptote up or down
 $h \rightarrow$ move vertical asymptote left or right

$y = \frac{a}{x-h} + k$

Graph
 $y = \frac{-1}{x-2} - 2.5$

x	y
-2	-2.25
1	-1.5
1.5	-0.5
2	#DIV/0!
2.5	-4.5
3	-3.5
4	-3

You Try It!

coefficient of $x \rightarrow$ vertical shrink
 $a \rightarrow$ vertical stretch; reflection
 $k \rightarrow$ move horizontal asymptote up or down
 $h \rightarrow$ move vertical asymptote left or right

$y = \frac{a}{x-h} + k$

Graph
 $y = \frac{3}{x-1}$

You Try It!

coefficient of $x \rightarrow$ vertical shrink
 $a \rightarrow$ vertical stretch; reflection
 $k \rightarrow$ move horizontal asymptote up or down
 $h \rightarrow$ move vertical asymptote left or right

$y = \frac{a}{x-h} + k$

Graph
 $y = \frac{3}{x-1}$

x	y
-3	-0.75
0	-3
0.5	-6
1	#DIV/0!
1.5	6
2	3
5	0.75

You Try It!
