



Graphing Hyperbolic Functions

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Hyperbolas are smooth curves consisting of two pieces (connected components or branches) that are mirror images of each other. These branches are infinite and approach two asymptotes.

Simple form

$$f(x) = \frac{a}{x}$$

General form

$$f(x) = \frac{a}{x-h} + k$$

where coefficients a , h and k are real numbers, the variable x takes real values and $a \neq 0$. Note that **(h, k)** is the centre of the hyperbola.

Notation for writing the domain and range of functions:

EXAMPLE: Domain = $(-\infty \leq x \leq \infty, x \neq h)$,
Range = $(-\infty \leq y \leq \infty, y \neq k)$

Basic hyperbola $f(x) = \frac{1}{x}$

Basic hyperbolic function (no transformations)

If variable $a > 0$ $f(x) = \frac{4}{x}$

Function lies in the first and third quadrants and moves further away from both axes

If variable $a < 0$ $f(x) = -\frac{4}{x}$

Function lies in the second and fourth quadrants and moves further away from both axes

Shift in x -axis (h) $f(x) = \frac{1}{x-1}$

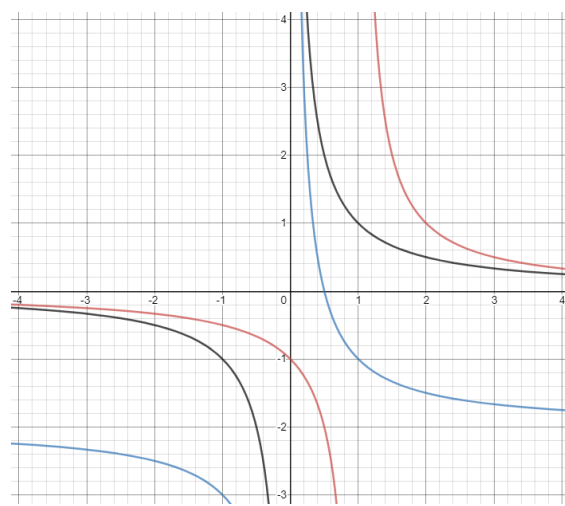
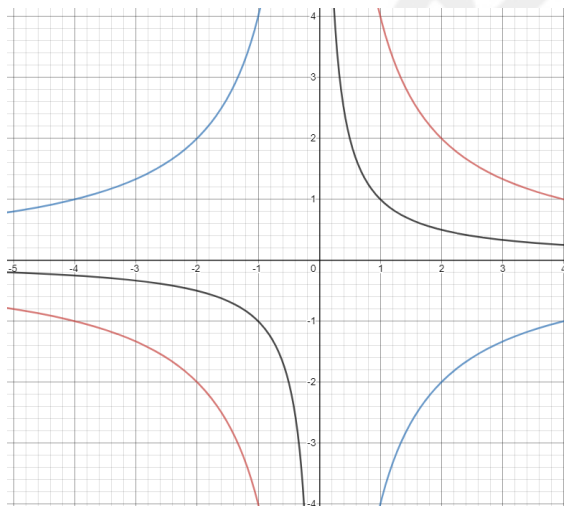
Function is shifted horizontally to the right

Please note $f(x) = \frac{a}{x-h} + k$

where h is negative

Shift in y -axis (k) $f(x) = \frac{1}{x} - 2$

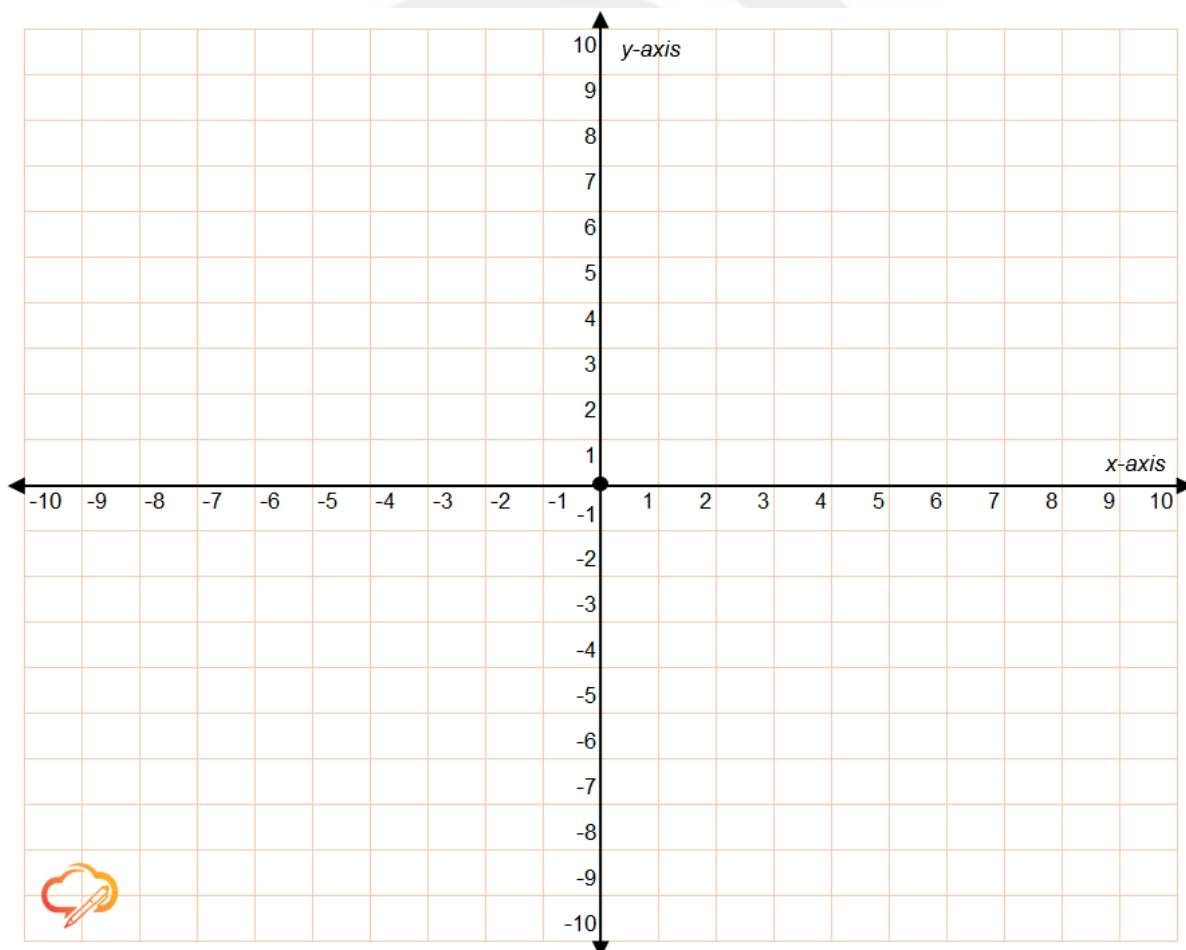
Function is shifted vertically down by two units





Instructions: Sketch and label the hyperbolas below.

1	$f(x) = \frac{1}{x}$	4	$f(x) = \frac{1}{x-2}$
2	$f(x) = -\frac{9}{x}$	5	$f(x) = \frac{1}{x+1} - 2$
3	$f(x) = \frac{4}{x} - 1$	6	$f(x) = -\frac{1}{x-3} + 1$





Instructions: Sketch and label the hyperbolas below.

1	$f(x) = \frac{1}{x}$	4	$f(x) = \frac{9}{x-3}$
2	$f(x) = -\frac{4}{x}$	5	$f(x) = \frac{16}{x} - 2$
3	$f(x) = -\frac{1}{x-1} + 1$	6	$f(x) = -\frac{1}{x+5} - 3$

