

# Hyperbola

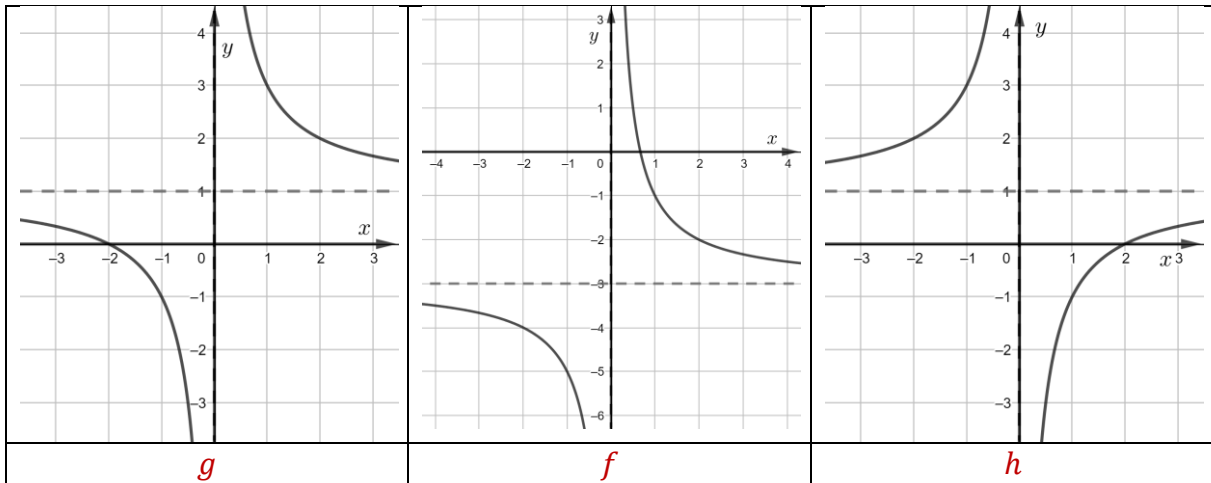
**Task 1.** Below are graphs of the functions:

$$f(x) = \frac{2}{x} - 3$$

$$g(x) = \frac{2}{x} + 1$$

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

Match the functions to their graphs.



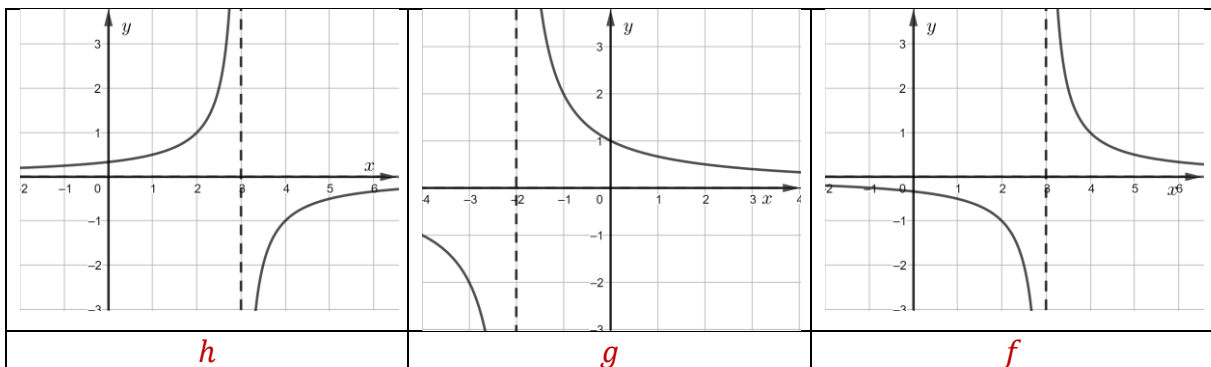
**Task 2.** Below are graphs of the functions:

$$f(x) = \frac{1}{x-3}$$

$$g(x) = \frac{2}{x+2}$$

$$h(x) = \frac{-1}{x-3}$$

Match the function formula to each graph.



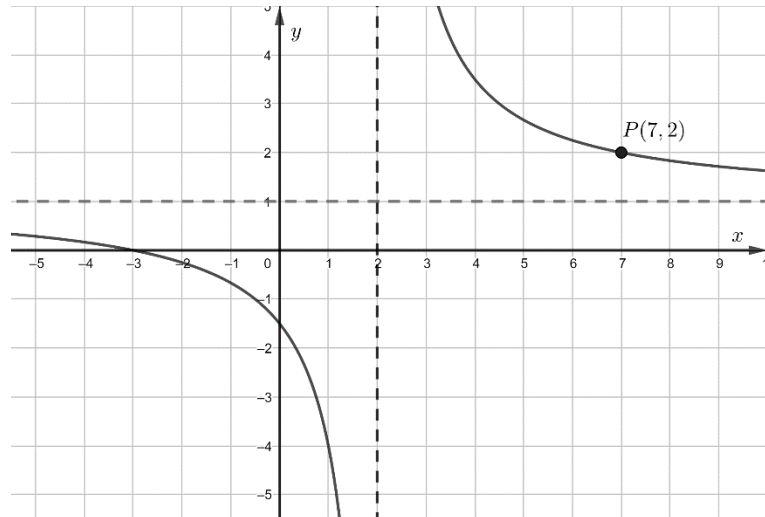
**Task 3.** Identify the vertical asymptote, horizontal asymptote, domain, and range of each function.

Function	Domain	Range	Vertical asymptote	Horizontal asymptote
$f(x) = \frac{2}{x} - 3$	$R - \{0\}$	$R - \{-3\}$	$x = 0$	$y = -3$
$g(x) = \frac{1}{x-3}$	$R - \{3\}$	$R - \{0\}$	$x = 3$	$y = 0$

## Hyperbola

### Task 4.

Determine the equation of the hyperbola based on the information given in the figure.



### Solution

We can see that the asymptotes vertical and horizontal cross out at the point  $(2, 1)$ .

Therefore the hyperbola is given by the equation  $y = \frac{a}{x-2} + 1$ .

We need to find the value of  $a$ .

To do this, we use the fact that the point  $P(7, 2)$  belongs to the hyperbola, so the pair of numbers  $x = 7, y = 2$  satisfies the equation:

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

$$2 = \frac{a}{7-2} + 1$$

$$2 = \frac{a}{5} + 1$$

$$\frac{a}{5} + 1 = 2$$

$$\frac{a}{5} = 1$$

$$a = 5$$

### Answer

Hyperbola is given by the equation  $y = \frac{5}{x-2} + 1$ .