

Graphing Calculator Lab

Analyze Graphs of Rational Functions

The equation of a rational function can be written in the form $y = \frac{a}{x-h} + k$. You can use a graphing calculator to explore how the changes in the parameters of a rational equation affect the graphs of rational functions as compared to the graph of the parent function $y = \frac{a}{x}$.

ACTIVITY

Graph the set of equations in the standard viewing window. Find the equations of any asymptotes.

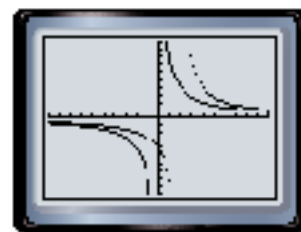
$$y = \frac{8}{x}$$

$$y = \frac{8}{x-2}$$

By looking at the equation $y = \frac{8}{x}$, we can determine that if $x = 0$, the function is undefined. The equation of its vertical asymptote is $x = 0$.

The function $y = \frac{8}{x-2}$ is undefined if $x = 2$. The equation of its vertical asymptote is $x = 2$.

In both graphs as the y -values approach 0 as x grows larger and as x gets smaller. So, the equation for the horizontal asymptote is $y = 0$.



The activity shows how changing the value of h in the general equation affects the graph. If $h > 0$, the graph shifts to the right h units. If $h < 0$, the graph shifts to the left h units.

ANALYZE THE RESULTS

1. Based on your experience with the graphs of quadratic functions, predict the effect of changing k on the graph of $y = \frac{a}{x-h} + k$.
2. Graph each set of equations in the standard viewing window. Describe any similarities and differences in the graphs. Do the results verify your conjecture?

$$y = \frac{5}{x}$$

$$y = \frac{4}{x}$$

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

$$y = \frac{5}{x} + 2$$

$$y = \frac{4}{x} - 3$$

$$y = \frac{2}{x+1} - 4$$

3. Explain how you can use the graph of the parent function $y = \frac{a}{x}$ to sketch the graph of $y = \frac{a}{x-h} + k$.