Graphs of Rational Functions

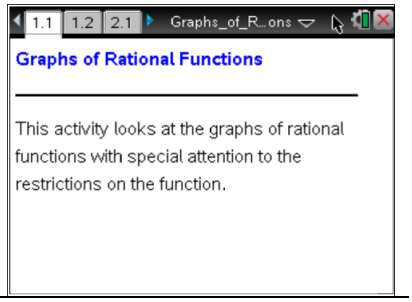
Student Activity

Name _____

Class _____

Open the TI-Nspire document
Graphs_of_Rational_Functions.tns.

Some functions have restrictions on their domain and range. This activity looks at such restrictions for rational functions.



Move to page 1.2.

Grab and drag point *P* across the screen from left to right.

1 a. Move slowly toward the *y*-axis from the left. Record what is happening to the graph. What is happening to the *x*-value? What is happening to the *y*-value?

b. Move slowly away from the *y*-axis toward the right. Record what is happening to the graph. What is happening to the *x*-value? What is happening to the *y*-value?

2 Given the equation for the graph: $f(x) = \frac{1}{x}$.

a. Explain how the graph changes as the *x*-value comes closer and closer to zero from the negative side and from the positive side.

b. Why is there an asymptote at $x = 0$?

c. What is the restriction on the domain of the function? Why?

d. Explain how the graph changes as the *x*-value becomes infinitely large (approaches positive infinity). Why does this happen?

e. Explain how the graph changes as the *x*-value becomes infinitely small (approaches negative infinity). Why does this happen?

f. What is the restriction on the range of the function? Why?

Move to page 2.1.

Grab and drag point *P* across the screen left and right. Notice the equation of the function listed below the graph.

3. Why are the asymptotes dotted and not solid lines?

4. Explain the relationship between the equation of the asymptote and the equation of the rational function.

5. What transformation is being done to the graph of the rational function $f(x) = \frac{1}{x}$ as you move point *P*?

6. Move point *P* so that the asymptote is $x = 3$. Explain how the graph changes as the *x*-value becomes infinitely large or small (approaches positive or negative infinity). Is this answer different from your answers to question 2a and b?

7. Write an equation of a rational function with a vertical asymptote at $x = -2$. What is the restriction on the domain for the equation?

8. What would be the equation of the function $f(x) = \frac{1}{x+1}, x \neq -1$ after a horizontal shift of 3 units to the right? Include the new restriction.

Move to page 3.1.

Grab and drag points *P1* and *P2* across the screen from left to right. Notice the equation of the function listed below the graph.

9. What would be an equation of a rational function with the restrictions $x \neq \pm 1$?

10. a. Describe what happens when *P1* = *P2*.

b. If *P1* = *P2* = 2, how does the graph differ from the graph of $f(x) = \frac{1}{x-2}, x \neq 2$?

11. How does the graph of the function $f(x) = \frac{1}{x^2+1}$ differ from the rational functions we have looked at in this activity? You may want to use the Graph feature of the Scratchpad to explore this function or add a Graphs page to this activity.