Assignment

Write

Explain how the A-, B-, C-, and D-values of the transformation of the rational function $f(x) = \frac{1}{x}$ affect the horizontal and vertical asymptotes of the function.

Remember

Translations of a rational function $f(x)$ are given in the form $g(x) = Af(B(x - C)) + D$, where the D-value translates $f(x)$ vertically, and the C-value translates $f(x)$ horizontally.

Dilations of a rational function $f(x)$ are given in the form $g(x) = Af(B(x - C)) + D$, where the A-value vertically stretches $f(x)$ and the B-value horizontally stretches $f(x)$.

Practice

1. Consider the functions $f(x) = x^2 + x - 6$ and $g(x) = \frac{1}{x^2 + x - 6}$.
   a. Graph and label the function $f(x) = x^2 + x - 6$ on the given coordinate plane.
   b. Graph and label the function $g(x) = \frac{1}{x^2 + x - 6}$ on the same coordinate plane.
   c. Determine the domain, range, vertical asymptote(s), horizontal asymptote(s), and y-intercept of $g(x)$.
   d. How do the output values of $f(x)$ and $g(x)$ compare for any given input value?
2. Write a rational function with vertical asymptotes $x = 0$ and $x = 6$ and a horizontal asymptote $y = -2$. Sketch the function on the given coordinate plane.
3. Consider the basic rational function $f(x) = \frac{1}{x}$. Explain how the graph of each new function compares to the graph of $f(x)$.
   a. $g(x) = f(x + 5) - 9$
   b. $h(x) = \frac{10}{x} + 8$
   c. $m(x) = \frac{4}{x - 7} - 1$

Stretch

1. Consider the functions $f(x) = x^2 - x - 12$ and $g(x) = x - 4$.
   a. Create the rational function $h(x) = \frac{f(x)}{g(x)}$. Complete the table of values for the function $h(x)$ and then sketch the function.

x	-6	-4	0	4	6
$h(x)$					

   b. Does the sketch include any vertical asymptotes? Why or why not? Use algebra to explain.

c. Create the rational function $m(x) = \frac{g(x)}{f(x)}$. Complete the table of values for the function $h(x)$ and then sketch the function.

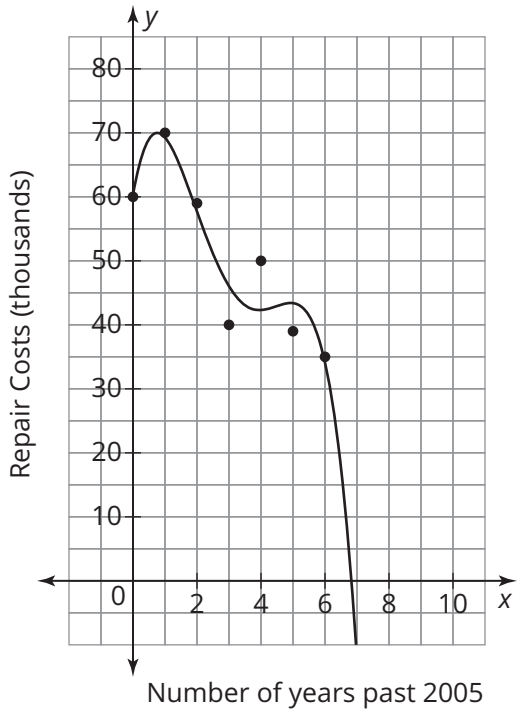
x	-5	-4	-3	-2	4	6
$m(x)$						

d. Does the sketch include any vertical asymptotes? Why or why not? Use algebra to explain.

e. If $f(x)$ and $g(x)$ are polynomials, are the vertical asymptotes of the rational function $R(x) = \frac{f(x)}{g(x)}$ always going to be the zeros of the function $g(x)$? Explain.

Review

1. Consider the function $f(x) = \frac{2}{x}$.
   a. Graph the function.
   b. Analyze the function and the corresponding table and graph. Describe the domain, range, and end behavior of the function. Determine all of the asymptotes of the function. Explain your reasoning.
2. The graph shows the amount of money spent by a town on road repairs over a 6 year period. The dots represent the actual data and the curve represents the quartic regression equation that best fits the data. Would you use the regression equation to make a prediction about how much the town spent in 2012? Explain your reasoning.



3. Macy measures the side lengths of a triangular piece of metal. The side lengths are 44 cm, 117 cm, and 125 cm.
   a. Verify that the triangular piece of metal is a right triangle.
   b. Use Euclid's Formula to determine the positive integers r and s, where $r > s$, that will generate these three side lengths.