IM 9–12 MATH v.1

Unit 2

Polynomials and Rational Functions

ALGEBRA 2

Lesson 17

Graphs of Rational Functions (Part 1)

Illustrative Mathematics®

Kendall Hunt

Learning Goal

Algebra 2

Let's explore graphs and equations of rational functions.

Illustrative Mathematics®

Kendall Hunt

Biking 10 Miles (Part 1)

Warm-up

Kiran's aunt plans to bike 10 miles.

1. How long will it take if she bikes at an average rate of 8 miles per hour?
2. How long will it take if she bikes at an average rate of r miles per hour?
3. Kiran wants to join his aunt, but he only has 45 minutes to exercise. What will their average rate need to be for him to finish on time?
4. What will their average rate need to be if they have t hours to exercise?

Biking 10 Miles (Part 2)

Kiran plans to bike 10 miles.

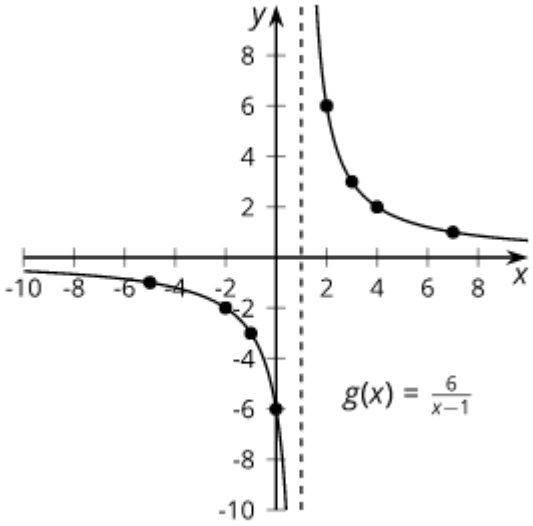
1. Write an equation that gives his time t, in hours, as a function of his rate r, in miles per hour.
2. Graph $y = t(r)$.
3. What is the meaning of $t(8)$? Does this value make sense? Explain your reasoning.
4. What is the meaning of $t(0)$? Does this value make sense? Explain your reasoning.
5. As r gets closer and closer to 0, what does the behavior of the function tell you about the situation?
6. As r gets larger and larger, what does the end behavior of the function tell you about the situation?

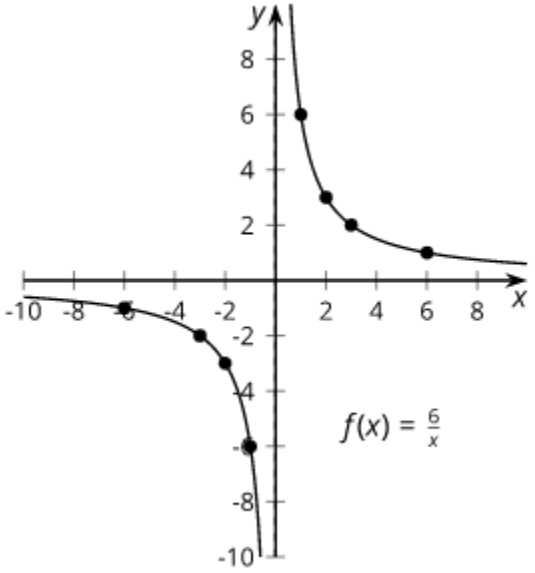
Card Sort: Graphs of Rational Functions

Notice and Wonder

f and g are both rational functions defined by $f(x) = \frac{6}{x}$ and $g(x) = \frac{6}{x-1}$. Here are their graphs.

What do you notice? What do you wonder?



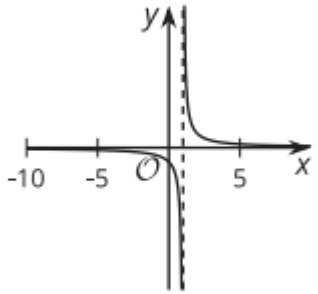


Your teacher will give you a set of cards. Match each rational function with its graphical representation.

Graphs of Rational Functions (Part 1)

Lesson Synthesis

A



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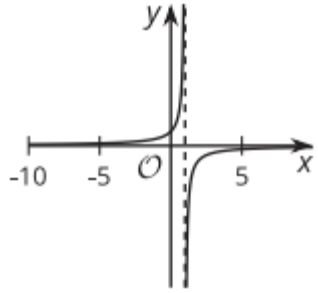

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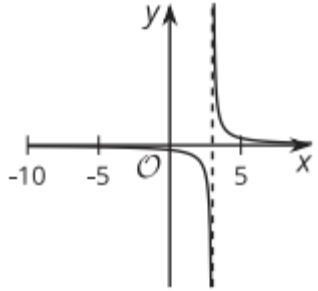

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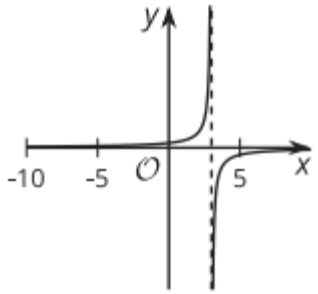

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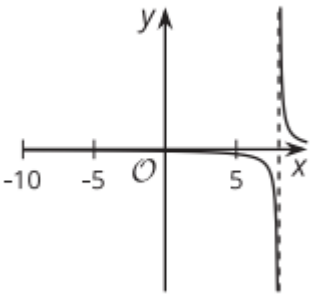

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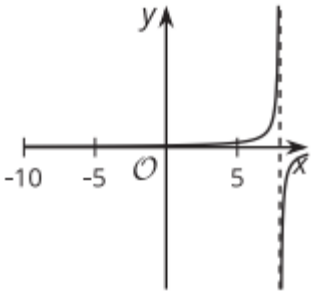

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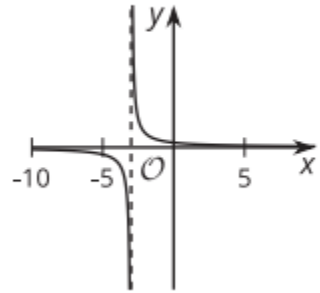

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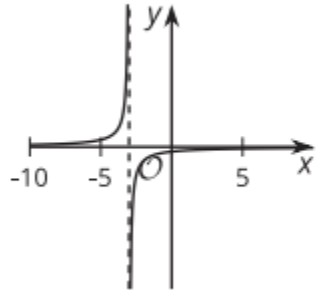
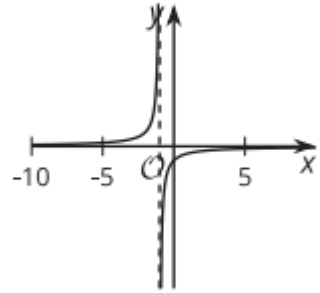


I



Graphs of Rational Functions (Part 1)

Lesson Synthesis

- What types of descriptions were helpful for identifying a graph?
- Graphs like A and B have the same asymptote. How did you know which one your partner was talking about?
- These graphs are either all positive or all negative depending on what side of the vertical asymptote they are on. Do you think that is true of all rational functions?

I can identify a vertical asymptote from a graph or an equation of a rational function.

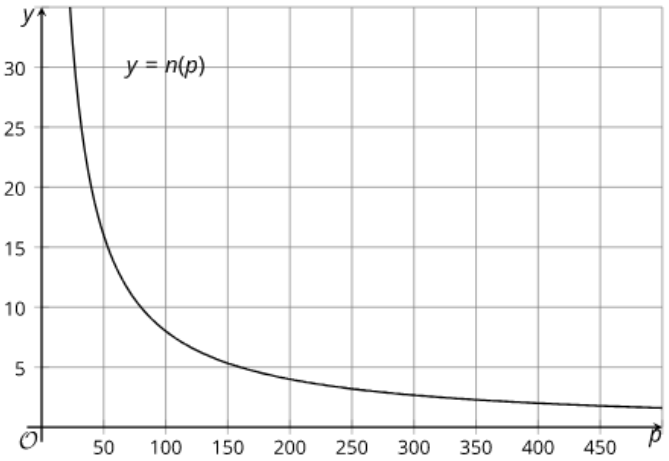
Learning Targets

Algebra 2

Homecoming T-shirts

Cool-down

The student council has \$800 to spend on homecoming T-shirts. The number of T-shirts they can buy is a function of the price of the T-shirt p, in dollars, given by $n(p) = \frac{800}{p}$. Here is a graph of $y = n(p)$.



1. As p gets closer and closer to 0, what does the behavior of the function tell you about the situation?
2. As p gets larger and larger, what does the end behavior of the function tell you about the situation?

rational function

A rational function is a function defined by a fraction with polynomials in the numerator and denominator. Rational functions include polynomials because a polynomial can be written as a fraction with denominator 1.

vertical asymptote

The line $x = a$ is a vertical asymptote for a function f if f is undefined at $x = a$ and its outputs get larger and larger in the negative or positive direction when x gets closer and closer to a on each side of the line. This means the graph goes off in the vertical direction on either side of the line.