IM 9–12 MATH v.1

Unit 2

Polynomials and Rational Functions

ALGEBRA 2

Lesson 9

End Behavior (Part 2)

Illustrative Mathematics®

Kendall Hunt

Learning Goal

Let's describe the end behavior of polynomials.

Algebra 2

Illustrative Mathematics®

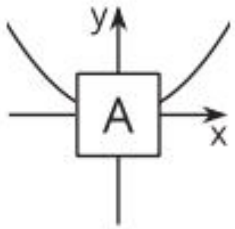
Kendall Hunt

It's a Cover Up

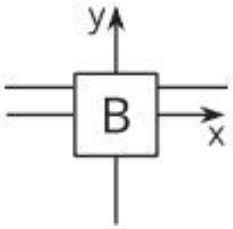
Warm-up

Match each of the graphs to the polynomial equation it represents. For the graph without a matching equation, write down what must be true about the polynomial equation.

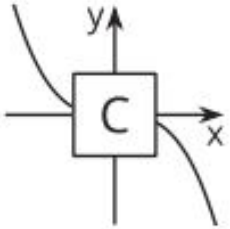
A



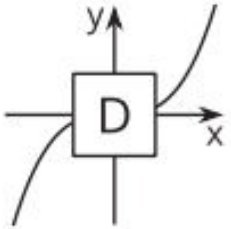
B



C



D



1. $y = x(x + 3)(2 - x)$
2. $y = 1 - 3x + 5x^4$
3. $y = 5(x + 3) - 5x$

The Case of Unexpected End Behavior

1. Write an equation for a polynomial with the following properties: it has even degree, it has at least 2 terms, and, as the inputs get larger and larger in either the negative or positive directions, the outputs get larger and larger in the negative direction.

   Pause here so your teacher can review your work.

1. Write an equation for a polynomial with the following properties: it has odd degree, it has at least 2 terms, as the inputs get larger and larger in the negative direction the outputs get larger and larger in the positive direction, and as the inputs get larger and larger in the positive direction, the outputs get larger and larger in the negative direction.

Which is Greater?

M and N are each functions of x defined by $M(x) = -x^3 - 2x + 8$ and $N(x) = -20x^2 + 3x + 8$.

1. Describe the end behavior of M and N.
2. For $x > 0$, which function do you think has greater values? Be prepared to share your reasoning with the class.

End Behavior (Part 2)

Lesson Synthesis

We will play another game. This time, you will supply the equations.

1. A series of polynomial equations will be displayed one at a time.
2. After an equation is displayed, there will be a brief quiet think time to identify the end behavior. Give a hand signal when you are ready.
3. When you hear "Pose!", use your arms to show the end behavior of the function. For example, for $y = x^2$, you put both hands up in the air. For something like $y = x^3$, you have your left arm down and your right arm up.

I can identify the end behavior of a polynomial function from its equation.

Learning Targets

Algebra 2

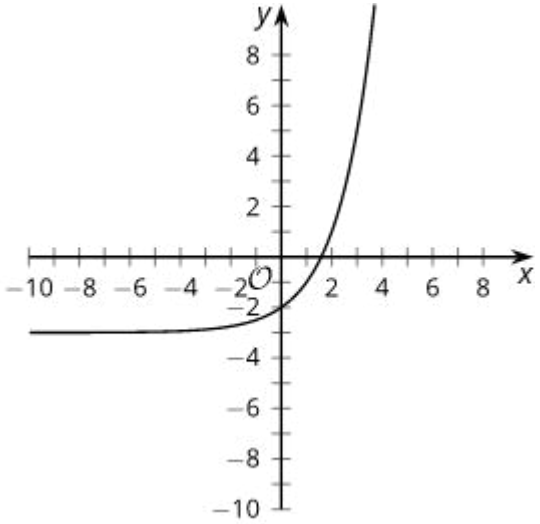
Describe the End Behavior

Cool-down

Describe the end behavior of $f(x) = -x^4 + x^2 - x + 1$

end behavior

How the outputs of a function change as we look at input values further and further from 0.



This function shows different end behavior in the positive and negative directions. In the positive direction the values get larger and larger. In the negative direction the values get closer and closer to -3.