IM 9–12 MATH v.1

Unit 2

Polynomials and Rational Functions

ALGEBRA 2

Lesson 11

Finding Intersections

Illustrative Mathematics®

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Learning Goal

Let's think about two polynomials at once.

Algebra 2

When f Meets g

Warm-up: Math Talk

Mentally identify a point where the graphs of the two functions intersect, if one exists.

- $f(x) = x$ and $g(x) = 3$
- $j(x) = (x + 3)(x - 3)$ and $k(x) = 0$
- $m(x) = (x + 3)(x - 3)$ and $n(x) = (x - 3)$
- $p(x) = (x + 5)(x - 5)$ and $q(x) = (x + 3)(x - 3)$

More Points of Intersection

$$a(x) = (x + 2)(x - 2) \text{ and } b(x) = (x - 2)$$

For each pair of polynomials given, find all points of intersection of their graphs.

1. $c(x) = x^2 - 7$ and $d(x) = 2$
2. $f(x) = (x + 7)(x - 4)$ and $g(x) = x - 4$
3. $m(x) = (x + 7)(x - 4)$ and $n(x) = (2x + 5)(x - 4)$
4. $p(x) = (x + 1)(x - 8)$ and $q(x) = (x + 2)(x - 4)$

Graphing to Find Points of Intersection

Consider the functions and $p(x) = 5x^3 + 6x^2 + 4x$ and $q(x) = 5640$.

1. Use graphing technology to find a value of x that makes $p(x) = q(x)$ true.
2. For the x-value at the point of intersection, what can you say about the value of $5x^3 + 6x^2 + 4x - 5640$?
3. What does your answer suggest is a possible factor of $5x^3 + 6x^2 + 4x - 5640$?
4.
   a. Write your own polynomial $m(x)$ of degree 3 or higher.
   b. Use graphing technology to estimate the values of x that make $m(x) = q(x)$ true.

Finding Intersections

Lesson Synthesis

$y = x + 5$

$y = 5 - x$

$y = x + 5$

$y = (x - 2)(x + 5)$

I can find where two polynomial functions intersect.

Learning Targets

Algebra 2

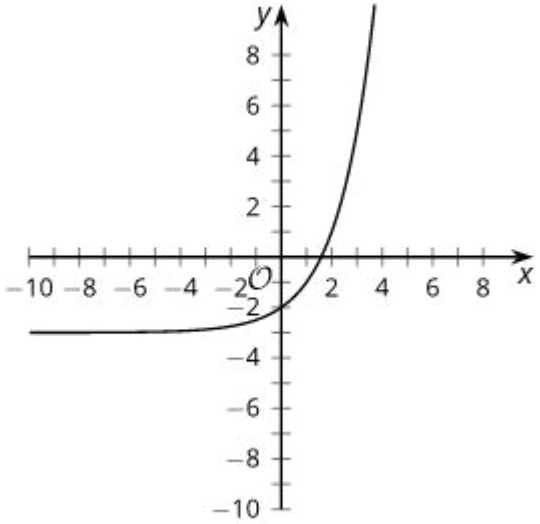
Find Some More Points

Cool-down

Find all points of intersection between the graphs of the functions $f(x) = (x + 5)(x - 4)$ and $g(x) = x + 5$.

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.

multiplicity

The power to which a factor occurs in the factored form of a polynomial. For example, in the polynomial $(x - 1)^2(x + 3)$, the factor $x - 1$ has multiplicity 2 and the factor $x + 3$ has multiplicity 1.