



Connecting Factors and Zeros

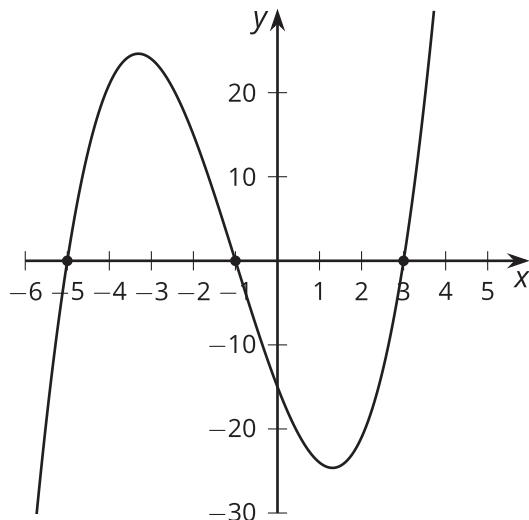
Let's investigate polynomials written in factored form.

5.1

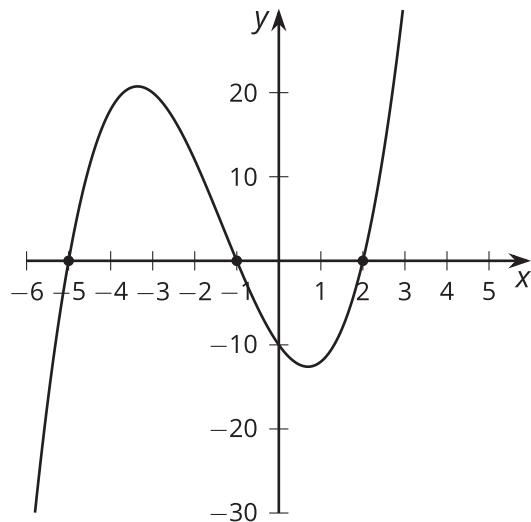
Notice and Wonder: Factored Form

What do you notice? What do you wonder?

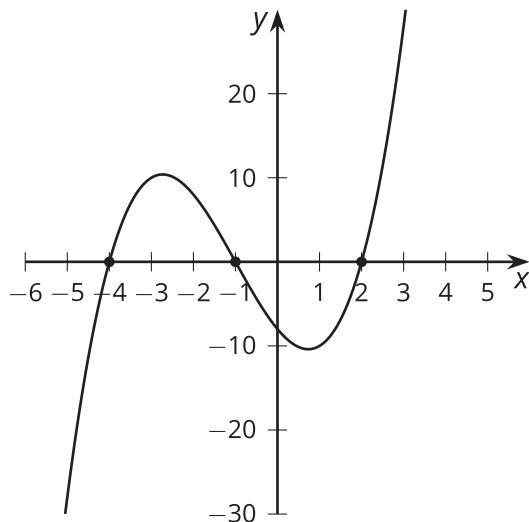
$$f(x) = (x + 5)(x + 1)(x - 3)$$



$$g(x) = (x + 5)(x + 1)(x - 2)$$



$$h(x) = (x + 4)(x + 1)(x - 2)$$



5.2

What Values of x Make These Equations True?

Find all values of x that make the equation true.

1. $(x + 4)(x + 2)(x - 1) = 0$
2. $(x + 4)(x + 2)(x - 1)(x - 3) = 0$
3. $(x + 4)^2(x + 2)^2 = 0$
4. $-2(x - 4)(x - 2)(x + 1)(x + 3) = 0$
5. $(2x + 8)(7x - 3)(x - 10) = 0$
6. $x^2 + 3x - 4 = 0$
7. $x(3 - x)(x - 1)(x + 0.75) = 0$
8. $(x^2 - 4)(x + 9) = 0$



Are you ready for more?

1. Write an equation that is true when x is equal to -5, 4, or 0 and for no other values of x .
2. Write an equation that is true when x is equal to -5, 4, or 0 and for no other values of x , and where one side of the equation is a 4th-degree polynomial.

5.3

Card Sort: Factors, Intercepts, and Graphs

Your teacher will give you a set of cards. Take turns with your partner to match each equation to either a graph or a description of a graph.

1. For each match that you find, explain to your partner how you know it's a match.
2. For each match that your partner finds, listen carefully to their explanation. If you disagree, discuss your thinking and work to reach an agreement.

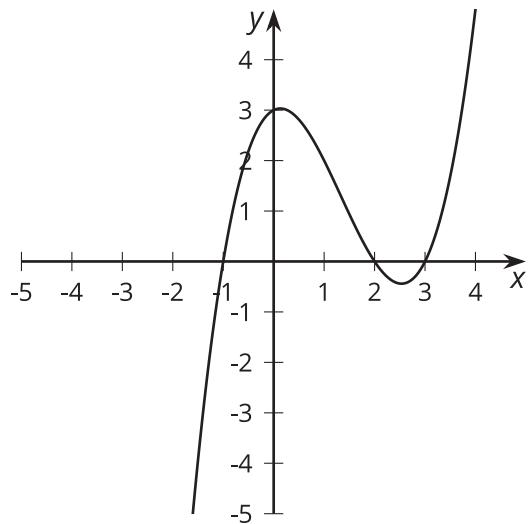


Lesson 5 Summary

When a polynomial is written in factored form, we can identify several facts about it.



For example, the factored form of the polynomial shown in the graph is $P(x) = 0.5(x - 3)(x - 2)(x + 1)$.



The graph has x -intercepts at $x = 3, 2$, and -1 . Each of these x -values makes one of the factors in the expression $0.5(x - 3)(x - 2)(x + 1)$ equal to 0, and so makes the equation $P(x) = 0$ true. The numbers $3, 2$, and -1 are known as the *zeros* of the function.

When a polynomial is not written in factored form, identifying the zeros from the expression for the polynomial can be more challenging. We'll learn how to do that in future lessons.