Unit 2, Lesson 5

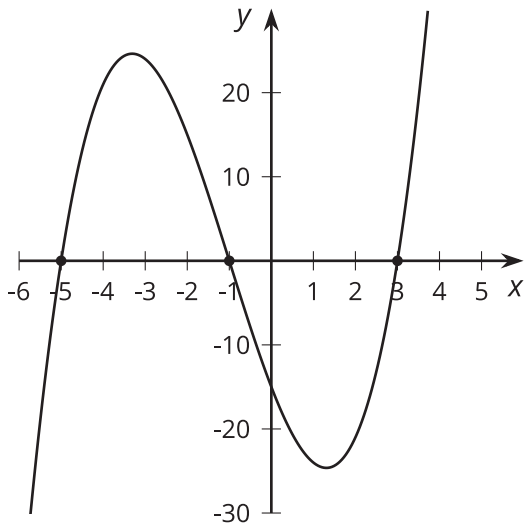
# Connecting Factors and Zeros

Let's investigate polynomials written in factored form.

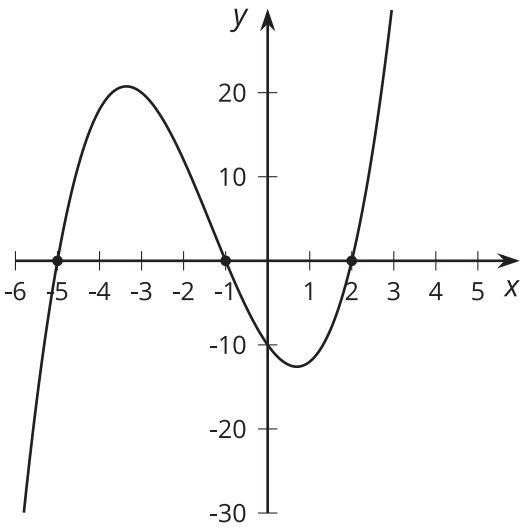
## 5.1 Notice and Wonder: Factored Form

What do you notice? What do you wonder?

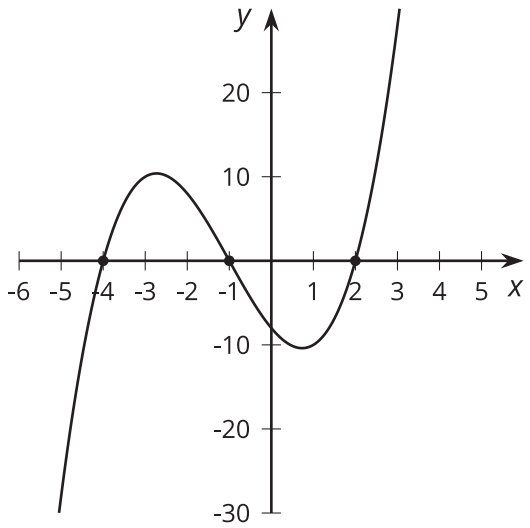
$f(x) = (x + 5)(x + 1)(x - 3)$




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




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



# 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

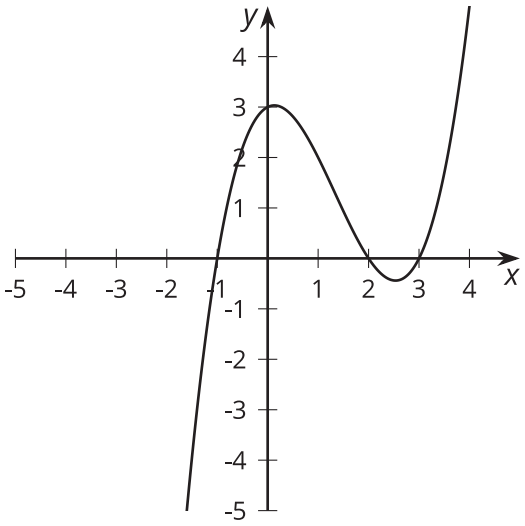
Your teacher will give you a set of cards. Take turns with your partner to match each equation to either a graph or a description of a graph.

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.