Unit 2, Lesson 3

Introducing Polynomials

Let’s see what polynomials can look like.

3.1 Which Three Go Together: What Are Polynomials?

Which three go together? Why do they go together?

A

$$4 - x^2 + x^3 - 4x$$

B

$$2x^4 + x^2 - 5.7x + 2$$

C

$$x^2 + 7x - x^{\frac{1}{3}} + 2$$

D

$$x^5 + 8.36x^3 - 2.4x^2 + 0.32x$$

3.2 Card Sort: Equations and Graphs

Your teacher will give you a set of cards containing equations and graphs. Match each equation with a graph that represents the same **polynomial** function. Record your matches and be prepared to explain your reasoning.

3.3 Let's Make Some Curves

Use graphing technology to write equations for polynomial functions whose graphs have the characteristics listed, when plotted on the coordinate plane.

1. A 1st-**degree** polynomial function whose graph intercepts the vertical axis at 8.

2. A 2nd-degree polynomial function whose graph has only positive y-values.

3. A 2nd-degree polynomial function whose graph contains the point $(0, -9)$.

4. A 3rd-degree polynomial function whose graph crosses the horizontal axis more than once.

5. A 4th-degree or higher polynomial function whose graph never crosses the horizontal axis.

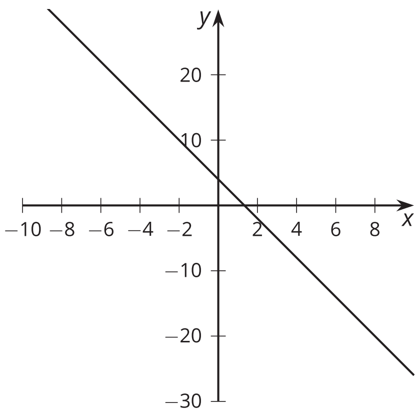
Are you ready for more?

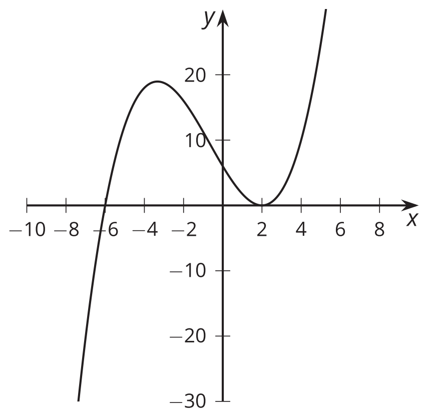
Find the equation for a polynomial function whose graph resembles each letter: U, N, M, W.

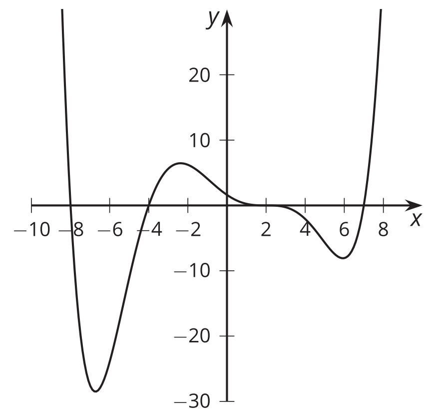
Lesson 3 Summary

Polynomials are often classified by their **degree**, the highest exponent on the independent variable. For example, a quadratic function, like $g(t) = 10 + 96t - 16t^2$, is considered a 2nd-degree polynomial because the highest exponent on t is 2. Similarly, a linear function like $f(x) = 3x - 10$ is considered a 1st-degree polynomial. Earlier, we considered the function $V(x) = (11 - 2x)(8.5 - 2x)(x)$, which gives the volume, in cubic inches, of a box made by removing the squares of side length x, in inches, from each corner of a rectangle of paper and then folding up the 4 sides. This is an example of a 3rd-degree polynomial, which is easier to see if we use the distributive property to rewrite the equation as $V(x) = 4x^3 - 39x^2 + 93.5x$.

Graphs of polynomials have a variety of appearances. Here are three graphs of different polynomials with degree 1, 3, and 6, respectively:







Since graphs of polynomials can curve up and down multiple times, they can have points that are higher or lower than the rest of the points around them. These points are **relative maximums** and **relative minimums**. In the second graph, there is a relative maximum at about $(-3, 18)$ and a relative minimum at $(2, 0)$. The word relative is used because while these are maximums and minimums relative to surrounding points, there are other points that are higher or lower.

