

What's Going On?

Checking In

Minds on

Whiteboard Sketches

Action!

Desmos investigation

Consolidation

Polynomial or Not

Learning Goal - I will be able to identify tables, graphs and equations that represent polynomial functions.

Minds on

Whiteboard Sketches

On your whiteboard, draw a sketch of what you think each function might look like:

$$f(x) = x$$

$$f(x) = x^2$$

$$f(x) = x^3$$

$$f(x) = x^4$$

$$f(x) = x^5$$

Action!

Exploring Polynomial Functions with Desmos

Action!

Polynomial Function Basics

A **polynomial function** in one variable is an expression of the form:

$$\mathbf{a_n x^n + a_{n-1} x^{n-1} + \dots + a_2 x^2 + a_1 x + a_0}$$

where a_0, a_1, \dots, a_n are real numbers and n is a whole number. Powers are arranged in descending order.

Examples

$$f(x) = 4x^3 - 3x^2 + x - 1$$

Action!

Polynomial Function Basics

The **degree** of a function is the highest exponent in the expression.

Examples

$$f(x) = 2x^5 - 3x^2 + 1$$

degree 5

Action!

Polynomial Function Basics

The finite differences of a polynomial function can help determine the degree of the function.

$$f(x) = 2x^4 - 3x + 1$$

4th diff.
constant

$$g(x) = x^5 - 2x^3 + 5x$$

5th diff.
constant

$$h(x) = -x^3 - 3x^2 - 2x + 1$$

3rd differences
constant

In a n^{th} degree polynomial function, the n^{th} differences are constant.

$$f(x) = 2x^4 - 3x + 1$$

x	y
-2	39
-1	6
0	1
1	0
2	27
3	154
4	501

The table above shows the function values. The following table shows the step-by-step calculation of each value using the formula $f(x) = 2x^4 - 3x + 1$.

x	$2x^4$	$-3x$	Sum	+1	y
-2	32	6	38	39	39
-1	2	3	5	6	6
0	0	0	0	1	1
1	2	-3	-1	0	0
2	32	-6	26	27	27
3	54	-9	45	154	154
4	128	-12	116	501	501

Action!

Polynomial Function Basics

Domain of Polynomial Functions

$$D = \{ x \in \mathbb{R} \}$$

Range of Polynomial Functions

$$R = \{ f(x) \in \mathbb{R} \} \text{ for all odd degree functions}$$

Even functions: range will be \geq or \leq the absolute min. or absolute max.

Action!

Polynomial Function Basics

The graphs of polynomial functions do not have asymptotes.

Action!

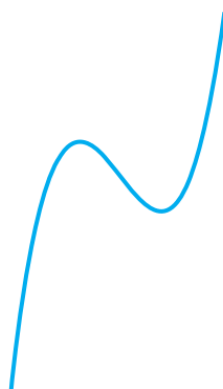
Polynomial Function Basics



Linear
($n = 1$)



Quadratic
($n = 2$)



Cubic
($n = 3$)



Quartic
($n = 4$)



Quintic
($n = 5$)

Consolidation

Polynomial Function or Not?

$$-7$$

$$(2x - 3)(x + 1)^2$$

$$3x^3 + 4x^{2.5}$$

$$-4x$$

$$\sqrt{4x^3} - \frac{\sqrt{5}}{3}x^2 + 2x - \frac{1}{4}$$

$$\frac{1}{2x + 5}$$

$$x^2y + 3x - 4y^{-2}$$

$$-4x + 5x^7 - 3x^4 + 2$$

$$6x^3 + 5x^2 - 3x + 2 + 4x^{-1}$$

$$\frac{3x^2 + 5x - 1}{2x^2 + x - 3}$$

$$\sin(x - 30)$$

$$3x - 5$$

$$3x^2 - 5x + 3$$

$$4^x + 5$$

$$\frac{2}{5}x^3 - 3x^5 + 4$$

$$\sqrt{x} + 5x^3$$

P_g 127

1, 2, 3, 5