

# Polynomials

[Unit 4]

What is a polynomial?

Extrema

Increasing / Decreasing

Positive / Negative

Zeros

$$y = (x+2)(x^2 - 1)$$

Polynomial Vocab

Multiplicity

End Behavior

Polynomial: An expression in the form:

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

where  $n$  is a positive number.

Ex)

$$-4x^3 + 7x - 1$$

$$-2x^2 + 2$$

$$\frac{1}{2} x^6$$

Non-Examples:

•  $x^{-1}$  → can't have negative exponents

•  $5x^{\frac{1}{2}} - 8$  → can't have fractional exponents

•  $11^x$  → can't have variable as exponent

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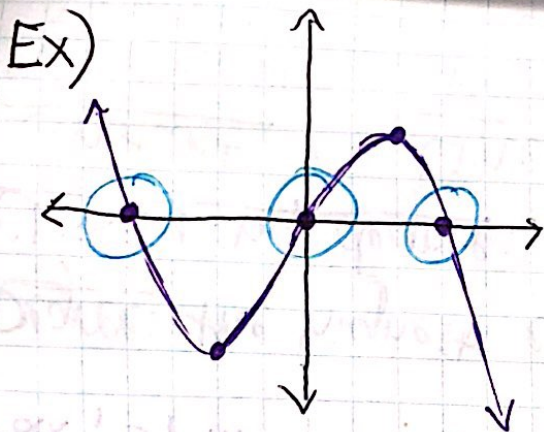
End Behavior



Zero: The number "k" is said to be a zero of a polynomial if  $f(k) = 0$ .

• "k" is often referred to as the "root" or "solution"

• "k" is also known as the x-intercept of the graph! [where it crosses the x-axis!]



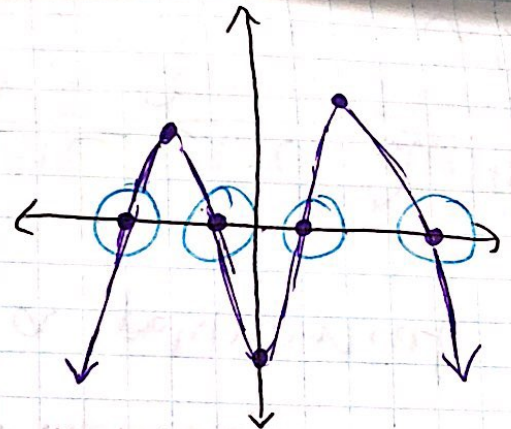
Zeros:

$$x = -4, x = 0, x = 3$$

Factored Form:

$$y = (x+4)(x-3)x$$

Ex)



Zeros:

$$x = -3, x = -1, x = 1, x = 4$$

Factored Form:

$$y = (x+3)(x+1)(x-1)(x-4)$$

\* Change the sign when going into factored form

Zeros.

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Terms: a single number or variable separated by a + or - sign

Classify by term:

Monomial

1 term

$2x, 3, 4x^3$

Binomial

2 terms

$2x + 3$

Trinomial

3 terms

$3x^2 + 4x - 1$

Polynomial

4 or more terms

$5x^3 - 3x^2 + 2x - 1$

Degree: the highest exponent of a polynomial

Classify by degree:

Constant

no variables

Degree 0

Linear

Degree 1

( $x$ )

Quadratic

Degree 2

( $x^2$ )

Cubic

Degree 3

( $x^3$ )

Quartic

Degree 4

( $x^4$ )

Any # greater than 4 is called an  $n^{\text{th}}$  degree polynomial

ex)  $5x^8 + 2x^3 - 6x^2 - 1 \rightarrow 8^{\text{th}}$  degree Polynomial

POLYNOMIAL	NUMBER OF TERMS	CLASSIFICATION BY TERMS	DEGREE	CLASSIFICATION BY DEGREE
$f(x) = 5$	1	Monomial	0	Constant
$g(x) = 4x - 3$	2	Binomial	1	Linear
$p(x) = -2x^5$	1	Monomial	5	$5^{\text{th}}$ degree
$w(x) = x^4 - 4x + 2$	3	Trinomial	4	Quartic
$y = -4x^2 + x + 9$	3	Trinomial	2	Quadratic
$h(x) = 4x^3 + x^2 - 9x + 2$	4	Polynomial	3	Cubic

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