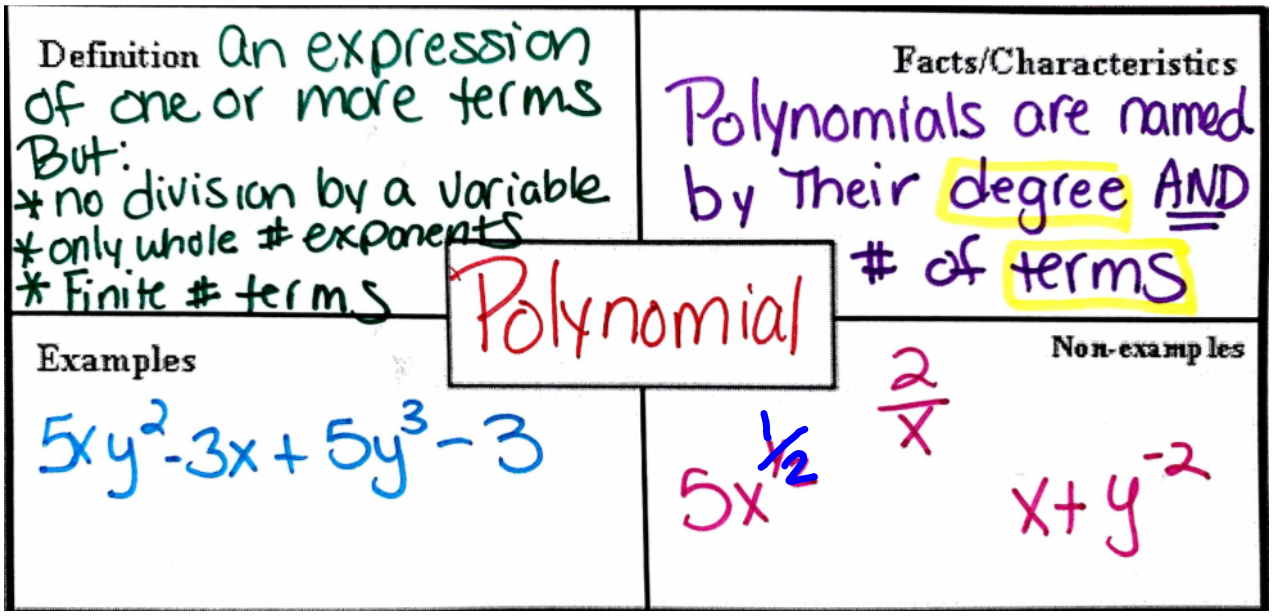
# Introduction to Polynomials


Definition An expression of one or more terms
But:
* no division by a variable
* only whole # exponents
* Finite # terms
Facts/Characteristics
Polynomials are named by their degree AND # of terms
Polynomial
Examples
$5xy^2-3x+5y^3-3$
Non-examples
$5x^{1/2}$
$\frac{2}{x}$
$x+y^{-2}$

# Monomial

- A numeral, variable, or combination of numeral & one or more variables. 1 term
- Monomial with no variable is called a constant.
- Which of the following are monomials?

$7$ yes

$3xy$ yes

$x - y$ NO b/c 2 terms

# Coefficient

- Numeral factor in a monomial
- Give the coefficient of each:

$-ab$ $\quad$ $\frac{2x}{3} = \frac{2}{3}x$ $\quad$ $\frac{mn}{4}$ $\quad$ $h$

$-1$ $\quad$ $\frac{2}{3}$ $\quad$ $\frac{1}{4}$ $\quad$ $1$

# Degree of a Monomial

- Sum of the exponents of the variables.
- Find the degree of each:

$3x^5y^1$

$5+1=6$

$6^{th}$ degree

$-2xyz^1$

$1+1+1$

$3^{rd}$ degree

$54x^0$

$54 \cdot 1$

$54$

degree = 0

# Polynomials

- Example:

Degree of polynomial is the same as the term with the greatest degree

$3x^4 - 2x^3 - x^2 + 8x - 9$

degree: 4 3 2 1 0

Polynomial: degree = 4

Standard form: highest degree to the lowest.

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

6 4 2

degree = 6

$x^2y^3$ $x^3y^2$

Polynomials can be named by their degree:

Polynomials are named according to their degree and number of terms.

For a polynomial with one variable, the degree is the lrgst degree of that variable.

| Degree | Name | Example |
|---|---|---|
| 0 | Constant | 3 |
| 1 | Linear | $2x+1$ |
| 2 | Quadratic | $x^2-4x$ |
| 3 | Cubic | $2x^3-x+4$ |
| 4 | Quartic | $3x^4-5$ |
| 5 | Quintic | $x^5+3x-10$ |
| 6+ | 6th degree. | $x^6$ |

# Classify by number of Terms

Terms are always Separated by add & Subtract

| Terms | Name | Example |
|---|---|---|
| 1 | Monomial | $3x$ |
| 2 | Binomial | $x-4$ |
| 3 | Trinomial | $x^2+2x+3$ |
| 4+ | 4 term Polynomial | $x^6+x^2+x+10$ |

Let's Practice! Name the following polynomials:

$-7 + 3n^3$ Cubic binomial

5 Constant monomial

$-x^4 + 3x^2 - 11$ Quartic Trinomial

# Classify by degree & # terms

$5x^4$

Quartic monomial

$3x^2 - 2x^3 - 7$

Cubic trinomial

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

$3x^5 - x^3$ Simplify first!

Quintic binomial

# Evaluate for x = -3

Evaluate f(-3)

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

$$f(-3) = -(-3)^2 - 3(-3) + 2$$

$$-9 + 9 + 2$$

$$f(-3) = 2$$

| x | y |
|---|---|
| -3 | 2 |

## Evaluate for x = 4

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

# Find the sum:

$$\left(6x^3+3x^2-7\right)+\left(8-2x-6x^2+2x^3\right)$$

$6x^3+3x^2-7+8-2x-6x^2+2x^3$

$8x^3-3x^2-2x+1$

Cubic 4 term polynomial

## Find the difference:

$$\left(8x^3-4x^2+5x-1\right)-\left(3-3x+2x^2+2x^3\right)$$

$8x^3-4x^2+5x-1-3+3x-2x^2-2x^3$

$6x^3-6x^2+8x-4$

Find the product:

$(2x^2-5x+2)(3x^2-2x+10)$

$6x^4 - 4x^3 + 20x^2$

$-15x^3 + 10x^2 - 50x$

$6x^2 - 4x + 20$

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$6x^4 - 19x^3 + 36x^2 - 54x + 20$

Quartic 5 term polyn.