Monomial:
- an expression of the form $c x^n$, where the coefficient $c$ is a real number and the exponent $n$ is a nonnegative integer ($0, 1, 2, 3 \ldots$)
  - $3x^4$
  - $-\frac{1}{2}x$
  - $5x^0$, which is just 5

Binomial:
- sum of two monomials
  - $-3x + 5$

Trinomial:
- sum of three monomials
  - $\frac{1}{2}x^2 + x - 8$

Polynomial:
- a sum of any number of monomials
  - $-3x^5 + x^3 + \frac{1}{2}x^2 + 5x - 8$
  - $x^7 + 3x^4 - \frac{1}{2}x^3 - \frac{1}{2}x^2 - 3x + 5$

  - each monomial is called a term
  - terms with the same variable to the same powers are called **like terms**
    - in the polynomial $x^4 - x^3 + x^2 - 3x^2 + 3 - 10$, $x^2$ and $-3x^2$ are like terms because they have the same variable ($x$) to the same power (2)
    - 3 and $-10$ are also like terms because they have the same variable ($x$) to the same power (0)
    - combining like terms results in $x^4 - x^3 - 2x^2 - 7$

- the exponent of the variable in each term is called the degree
- the degree of the polynomial is largest degree of all the terms (this will be very important later when we identify quadratics)
- the leading coefficient of the polynomial is the coefficient of the term with the largest degree
Adding polynomials:  
- combine like terms (terms with the same variables to the same powers)  
  \[ (-6x^3 + 5x^2 - 8x + 9) + (17x^4 + 2x^3 - 4x - 13) \]

Distributive Property (monomial times a polynomial):  
- \( a(b + c) = ab + ac \)  
- once the factor \( a \) has been distributed, the expression goes from a product of two factors \( (a \text{ and } b + c) \) to a sum of two terms \( (ab \text{ and } ac) \)

Subtracting polynomials:  
- use the distributive property, then combine like terms  
- here the distributive property is used to multiply \(-1\) by each term in a polynomial that immediately follows a subtraction sign  
  \[ (8x^3 + 7x - 5) - (3x^2 - 4x) - (-6x^3 - 5x^2 + 3) \]
Example 1: Add and/or subtract the following polynomials and express each answer as a simplified polynomial.

a. \((5y^2 - 2xy + 6x^2 - 3x + 7y) + (3x^2 - 4x + 5) - (5y^2 - 3y + 6)\)

\[
5y^2 - 2xy + 6x^2 - 3x + 7y + 3x^2 - 4x + 5 - 5y^2 + 3y - 6
\]

\[
5y^2 - 2xy + 6x^2 - 3x + 7y + 3x^2 - 4x + 5 - 5y^2 + 3y - 6
\]

\[
-2xy + 9x^2 - 7x + 10y - 1
\]

\[
9x^2 - 7x - 2xy + 10y - 1
\]

b. \((4x^3 + 5x - 3) - (3x^3 + 2x^2 + 5x - 7) - 2(8x^2 - x - 2)\)

\[
4x^3 + 5x - 3 - 3x^3 - 2x^2 - 5x + 7 - 16x^2 + 2x + 4
\]

\[
x^3 - 18x^2 + 2x + 8
\]
c. $3(x^2 - 2x + 3) - 4(4x + 1) + 2(3x^2 - 2x)$

$$3x^2 - 6x + 9 - 16x - 4 + 6x^2 - 4x$$

$$9x^2 - 26x + 5$$

d. $5x^2 y - 3xy + xy^2 - 4\left(y^2 + \frac{1}{2} xy^2 - xy\right) + y(x^2 - x + 2y)$

$$5x^2 y - 3xy + xy^2 - 4y^2 - 2xy^2 + 4xy + x^2 y - xy + 2y^2$$

$$6x^2 y - xy^2 - 2y^2$$

Answer to Example:
1a. $9x^2 - 2xy - 7x + 10y - 1$; 1b. $x^3 - 18x^2 + 2x + 8$; 1c. $9x^2 - 26x + 5$; 1d. $6x^2 y - xy^2 - 2y^2$;