

**Synthetic Division** is a shortcut method of dividing polynomials (using long division).

Synthetic division can only be used when the leading coefficient of the divisor is 1.

For example,  $\frac{5x^3 + 11x^2 - 3x + 1}{x + 3}$  the division is  $x + 3$  and its leading coefficient is 1.

How to divide a polynomial using Synthetic Division

1. Write only the coefficients of the dividend and the opposite of the constant in the divisor.
2. Rewrite the first coefficient as the first coefficient in the quotient.
3. Multiply the coefficient by the constant divisor and add this product to the second coefficient.
4. Continue to multiply each new coefficient by the constant divisor and add this product to the next coefficient in the dividend.
5. The constants on the bottom line are the coefficients of the quotient and the remainder.

**\*\*Notice that the quotient polynomial is of degree one less than the original polynomial\*\***

Example 1: Divide by using synthetic division.

a. Divide:  $\frac{x^2 + 7x + 10}{x + 5}$

b. Divide:  $\frac{x^3 - 6x^2 + 8x - 5}{x - 2}$