POLYNOMAL EQUATION

FACTORS

> an expression which gives a remainder of zero when divided to P(x).

ROOTS

the solution to an equation/values of the variable which makes the equation true.

DEGREE

The highest exponent in a polynomial

CONSTANT

- > a value or number that never changes in an expression.
- ➤ A term where its variable has zero exponent

Review!

Polynomial Equation	Degree	Real Roots of the equation	Number of real roots
1. $(x+1)(x+5) = 0$	2	-1, -5	2
2. $x - 8 = 0$	1	8	/ 1
3. $(x+2)(x-2) = 0$	2	2, -2	2
4. $(x-3)(x+1)(x-1) = 0$	3	3,-1,1	3
5.x(x-4)(x+5)(x-1) = 0	4	4, -5, 1, 0	4
$6.(x-1)(x-3)^3 = 0$	4	3(3 times), 1	4
7. $(x^2 - 4x - 12)(x - 5)^3 = 0$	5	5(3 times), 6, -2	5

Fundamental Theorem of Algebra

 \triangleright If P(X) is a polynomial equation of degree nand with real coefficients, then it has at most n real roots.

Example: At most how many real roots does each polynomial have?

1.
$$x^{20} - 1$$

Ans. 20

$$2. x^3 - 2x^2 - 4x + 8 = 0$$

Ans. 3

3.
$$18 + 9x^5 - 11x^2 - x^{23} + x^{24} = 0$$
 Ans. 24

4.
$$a^{2000} + a^{2001} + 2 = 0$$

Ans. 2001

5.
$$y(y + 3)^7(y - 3)^9 = 0$$

Ans. 17

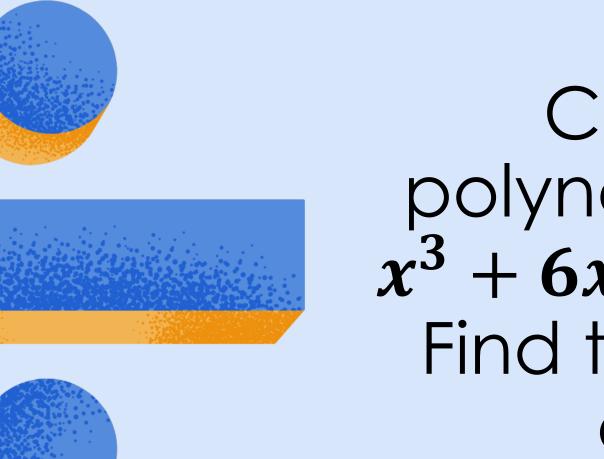
Finding Roots of Polynomial Equations by applying the factor theorem

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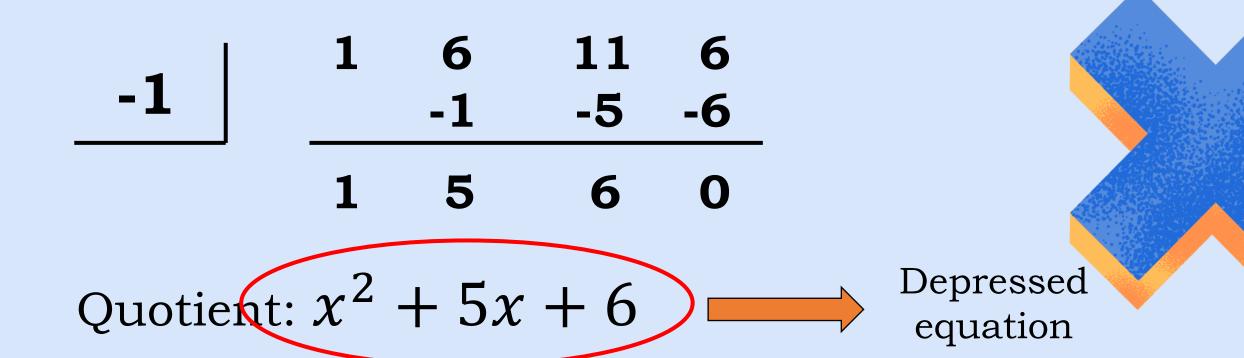
A. Recall: Factor Theorem

$$P(r) = 0$$
 if and only if $(x - r)$ is

a factor of
$$P(X)$$



Consider the polynomial equation $x^3 + 6x^2 + 11x + 6 = 0$. Find the roots of the equation.



Take note! The roots of the depressed equation are also roots of the given polynomial equation.

Therefore, the roots of the polynomial are -1, -3, and -2.

Examples. Find the roots of the following polynomial equation.

1.
$$x^3 - 2x^2 - x + 2 = 0$$

2.
$$x^3 + 9x^2 + 23x + 15 = 0$$

3.
$$x^3 - 2x^2 + 4x - 8 = 0$$

Examples. Find the roots of the following polynomial equation.

1.
$$-2x^4 + 13x^3 - 21x^2 + 2x + 8 = 0$$

$$2. x^4 - 3x^2 + 2 = 0$$

3.
$$x^4 - x^3 - 7x^2 + 13x - 6 = 0$$

4.
$$x^5 - 5x^4 - 3x^3 + 15x^2 - 4x + 20 = 0$$