POLYNOMIAL 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

- If $P(X)$ is a polynomial equation of degree n and 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

Finding Roots of Polynomial Equations by applying the factor theorem

A. Recall: **Factor Theorem**

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

a factor of $P(X)$.

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

-1	1	6	11	6
		-1	-5	-6
	1	5	6	0

Quotient: $x^2 + 5x + 6$ → Depressed 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. $x^5 - 5x^4 - 3x^3 + 15x^2 - 4x + 20 = 0$