NORTH-EX PUBLIC SCHOOL (Session 2020-21)

Class - IX

Subject - MATHS

Unit/Chapter -2 POLYNOMIALS

Topic –REMAINDER THEOREM, FACTOR THEOREM

Worksheet No -5

*Note- Before attempting the question and answers you must check the link given below which will help you understand the chapter thoroughly.

https://youtu.be/rqN55OL-tO8

You can download the assignment or if you do not have the facility to get printout then you can ask your ward to copy the assignment in a simple notebook and must do question and answers in the notebook.

NOTES

Remainder Theorem: Let p(x) be a polynomial of degree greater than or equal to one and let a be any real number. If p(x) is divided by the linear polynomial x-a , then remainder is p(a)

Proof: Let p(x) be any polynomial . Suppose that p(x) is divided by (x-a) , q(x) is quotient and r(x) is remainder. So by Division algorithm,

Dividend= Divisor X Quotient +Remainder

Now, p(x)= (x-a) q(x) +r(x)

Since the degree of x-a is 1,so degree of r(x) will be 0, it means r(x) is constant. So take r(x)=r

If x=a, then p(a) =(a-a) q(x) +r

P(a)=r

This proves the theorem

Example: Find the remainder when x^3- $3x^2$+2x-7 is divided by x-2

Sol: p(x) = x^3- $3x^2$+2x-7 , g(x)=x-2

Now to find zero of polynomial g(x), take g(x)= 0

So x-2=0

x=2 is zero of g(x)

Now, p(2) = 2^3-3x 2^2+2x 2-7

P(2) =8-12+4-7

$P(2) = -7$

By remainder theorem , -7 is remainder when p(x) is divided by g(x)

Factor Theorem:

If p(x) is any polynomial and a is any real number. By remainder theorem p(a) =r

If r=0, then g(x) is factor of p(x)

Remember that (numerically) if any number divided by other number completely and leaves no remainder, then divisor is factor of dividend. Similarly in solving polynomials also we follow same .

Example:

Check whether x+2 is a factor of $x^3 + 3x^2 + 5x + 6$

Sol: The zero of x+2 is -2, then by remainder theorem p(a) =r

So , $p(-2) = (-2)^3 + 3 \times (-2)^2 + 5 \times (-2) + 6$

$= -8 + 3 \times 4 - 10 + 6$

$= -8 + 12 - 10 + 6$

$= 0$

By factor theorem , here r=0

So x+2 is factor of $x^3 + 3x^2 + 5x + 6$

Example: Find the value of k if x-1 is the factor of $p(x) = x^2 + 5x - 7k$

Sol: By factor theorem , x-1 is factor of p(x), so r=0, then p(a)=0

Now , x-1=0

x=1 is zero of x-1

$p(1) = 1^2 + 5 \times 1 - 7k$

$p(1) = 1 + 5 - 7k$

$p(1) = 6 - 7k$ (here p(1)= 0 by factor theorem)

So, $6 - 7k = 0$

$6 = 7k$

$= k$

K= satisfies the polynomial when divides by x-1

WORKSHEET- 5

1.Find the remainder when $x^3 +2x^2-4x +5$ divided by $x-3$.

2. Find the remainder when $x^4-x^3 +4x^2+2x -1$ divided by $x+3$

3. Check whether $7+3x$ is a factor of $3x^3 +7x$.

4. Find the value of k, if $x-2$ is a factor of $4x^3+3x^2-4x +k$.

5. Determine which of the following polynomial has $(x+2)$ a factor.

(a) $x^3-2x^2-3x +10$ (b) $x^2 +4x -3$

ANSWERS

1.Remainder=38

2. Remainder=137

3. Remainder= , here remainder0 so $7+3x$ is not the factor of $3x^3 +7x$.

4. k=-36 at p(x) =0

5. (a) remainder=0, so $(x+2)$ is the factor of $x^3-2x^2-3x +10$

(b) remainder=-7, so $(x+2)$ is not the factor of $x^2 +4x -3$