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MODEL LESSON

MATHEMATICS

CHAPTER NUMBER :~ 2
CHAPTER NAME :~ POLYNOMIALS
SUB TOPIC :~ ZEROES OF POLYNOMIAL

Website: www.odmegroup.org
Email: info@odmps.org
Toll Free: 1800 120 2316
Sishu Vihar, Infocity Road, Patia, Bhubaneswar- 751024

PREVIOUS KNOWLEDGE TEST

1.Find the degree of the following polynomials

a)$x^5 - x^4 + 3$

b) 2

2.Classify the polynomials into linear, quadratic, cubic polynomials:-

a. $x^2 + x$

b.1+x

c.$7x^2$

d. $x - x^3$

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LEARNING OUTCOME:~

Students will learn

a) Zeroes of the Polynomials.

Question 1.

Which of the following expressions are polynomials in one variable and which are not? State reasons for your answer.

(i) $4x^2 - 3x + 7$
(ii) $y^2 + \sqrt{2}$
(iii) $3\sqrt{t} + t\sqrt{2}$
(iv) $y + 2y$
(v) $x^{10} + y^3 + t^{50}$

Solution:

(i) We have $4x^2 - 3x + 7 = 4x^2 - 3x + 7x^0$
It is a polynomial in one variable i.e., x
because each exponent of x is a whole number.

(ii) We have $y^2 + \sqrt{2} = y^2 + \sqrt{2}y^0$
It is a polynomial in one variable i.e., y
because each exponent of y is a whole number.

(iii) We have $3\sqrt{t} + t\sqrt{2} = 3\sqrt{t^{1/2}} + \sqrt{2}.t$
It is not a polynomial, because one of the exponents of t is 12,
which is not a whole number.

(iv) We have $y + y + 2y = y + 2.y^{-1}$
It is not a polynomial, because one of the exponents of y is -1,
which is not a whole number.

(v) We have $x^{10} + y^3 + t^{50}$
Here, exponent of every variable is a whole number,
but $x^{10} + y^3 + t^{50}$ is a polynomial in x, y and t, i.e.,
in three variables.
So, it is not a polynomial in one variable.

Question 2.
Write the coefficients of x^2 in each of the following

(i) $2 + x^2 + x$
(ii) $2 - x^2 + x^3$
(iii) $\pi 2\ x^2 + x$
(iv) $\sqrt{2}\ x - 1$

Solution:

(i) The given polynomial is $2 + x^2 + x$.
The coefficient of x^2 is 1.
(ii) The given polynomial is $2 - x^2 + x^3$.
The coefficient of x^2 is -1.
(iii) The given polynomial is $\pi 2x2 + x$.
The coefficient of x^2 is $\pi 2$.
(iv) The given polynomial is $\sqrt{2}\ x - 1$.
The coefficient of x^2 is 0.

Question 3.
Give one example each of a binomial of degree 35, and of a monomial of degree 100.

Solution:

(i) Abmomial of degree 35 can be $3x^{35}$ -4.
(ii) A monomial of degree 100 can be $\sqrt{2}y^{100}$.

Question 4.

Write the degree of each of the following polynomials.

(i) $5x^3+4x^2 + 7x$

(ii) $4 – y^2$

(iii) $5t – \sqrt{7}$

(iv) 3

Solution:

(i) The given polynomial is $5x^3 + 4x^2 + 7x$.

The highest power of the variable x is 3.

So, the degree of the polynomial is 3.

(ii) The given polynomial is $4 - y^2$. The highest power of the variable y is 2.
So, the degree of the polynomial is 2.

(iii) The given polynomial is $5t - \sqrt{7}$. The highest power of variable t is 1. So, the degree of the polynomial is 1.

(iv) Since, $3 = 3x^0$ [$\because x^0 = 1$]
So, the degree of the polynomial is 0.

Question 5.
Classify the following as linear, quadratic and cubic polynomials.

(i) $x^2 + x$

(ii) $x - x^3$

(iii) $y + y^2 + 4$

(iv) $1 + x$

(v) $3t$

(vi) r^2

(vii) $7x^3$

Solution:

(i) The degree of $x^2 + x$ is 2. So, it is a quadratic polynomial.

(ii) The degree of $x - x^3$ is 3. So, it is a cubic polynomial.

(iii) The degree of $y + y^2 + 4$ is 2. So, it is a quadratic polynomial.

(iv) The degree of $1 + x$ is 1. So, it is a linear polynomial.

(v) The degree of $3t$ is 1. So, it is a linear polynomial.

(vi) The degree of r^2 is 2. So, it is a quadratic polynomial.

(vii) The degree of $7x^3$ is 3. So, it is a cubic polynomial.

https://www.youtube.com/watch?v=dnZqhZZivGs

"As great a genius as Archimedes could not invent analytical geometry, for the algebraic knowledge necessary for such as achievement was not available in his time…"

~ *Nathan A. Court…*

Zeroes of the Polynomials

Consider a polynomial, say 3 x – 9
Denote it by p(x) i.e. we have p(x) = 3 x – 9

Now, value of the polynomial p(x) at 1 is given by putting x = 1 in p(x)
We write, p(1) = 3 (1) – 9
= 3 – 9
= - 6

In general, if p(x) is a polynomial then p(a) is the value of the polynomial at x = a .

In the above polynomial, p(x) = 3 x – 9
p(3) = 3 (3) – 9 = 0
We say that x = 3 is a zero of the polynomial p(x)

Formal Definition- A number c is zero of the polynomial p(x) if p(c) = 0

- If p(x) is a polynomial then p(x) = 0 is called the **polynomial equation**.
  Then if the number c is zero of the polynomial p(x) then c is called the **root of the polynomial equation** p(x) = 0

Important Notes

- Finding zero of the polynomial p(x) is the same as finding the root of the polynomial equation p(x) = 0.
  So, to find the zero of the polynomial p(x), we simply solve the equation p(x) = 0 .
- Consider a constant polynomial p(x) = b where b is any non-zero constant.
  Then, for any value of x, the value of the polynomial shall remain the same i.e. b.
  So, we conclude that a non-zero constant polynomial has no zero.
- The number 0 can be zero of a polynomial.
  (For example, p(x) = 4 x . Here, at x = 0, p(0) = 4 (0) = 0
- The zero of the polynomial does not necessarily has to be the number 0.
- (For example, p(x) = 2 x – 4 . Here, at x = 2, p(2) = 2 (2) – 4 = 0. Clearly, x = 2 is zero of the polynomial p(x) and x = 2 is a non-zero number.
- Every linear polynomial i.e. polynomial of the form a x + b where a, b are constants and a is non-zero, has one and only one zero.
  Consider, p(x) = a x + b
  The polynomial equation becomes, p(x) = a x + b = 0
  On solving, we get $x = -\frac{b}{a}$ which is the root of the polynomial equation p(x) = 0 and hence, is the zero of the polynomial p(x) .
- A polynomial can have more than one zero.

Evaluation:

1. Find the values of the polynomials if x=1 :-

a. $5x^2 + 3x + 7$ b. $5x^3 - 2x^2 + 3x - 2$

HOMEWORK:-

EXERCISE - 2.2

AHA:~

1. If x=0 and x=1 are roots of the polynomial $f(x)=2x^3-5x^2+ax+b$ $find\ a\ and\ b.$
2. Find integral roots of the polynomial $x^3-6x^2+11x-6.$
3. Find rational roots of the polynomial f(x)= $2x^3+x^2-7x-6$

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