HOLY TRINITY INTERNATIONAL SCHOOL

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Grade X

Mathematics

Chapter : 2 – Polynomials

A. Linear Polunomials.

What is a linear Polynomial? A Polynomial has the highest degree one is called a linear polynomial.

Examples : 3x+1, 2x-5, x+2, $\frac{1}{x+7}$, x-$\frac{12}{13}$, ... Here the degree of 'x' is one.

B. Quadratic Polynomial.

What is a quadratic Polynomial? A Polynomial of degree two is called a quadratic polynomial. There are two or three terms.

Examples : x^2-5x+6, x^2-9, $2x^2+5x-\frac{3}{2}$.

$\frac{x}{2}-\frac{3x^2}{5}+7$, $\sqrt{3}\,y^2+2y-1$, ...

C. What is the general form of a quadratic polynomial?

ax^2+bx+c, Where 'a' is the co-efficient of x^2, 'b' is the coefficient of x and 'c' is the constant. ie., a, b and c are real numbers and $a\neq0$.

D. What is a cubic polynomial?

A polynomial of degree 3 is called a cubic polynomial.

Examples : $9x^3-x^2+5x+1$, x^3-1, $2x^3+5x$, x^3-x^2+x+1, $7x^3+x^2-3$, ...

E. What is the general form of cubic polynomial?

ax^3+bx^2+cx+d, where a, b, c and d are real numbers, and $a\neq 0$.

F. Zero of a linear polynomial.

What is the general form of a linear polynomial?

ax + b (is the answer) where 'a' is the coefficient of x and b is the constant.

Usually a polynomial is denoted by P(x), if K is a zero of P(x)=ax+b, then P(k)=ak + b=0, ak=-b, then K= $-\frac{b}{a}$.

There fore, the zero of a linear polynomial ax + b is $-\frac{b}{a}=-\frac{Constant\ term}{Coefficient\ of\ x}$.

1. Example. Find the zero of the following linear polynomials

(i) 3x-5 (ii) 2x+3 (iii) x-2 (iv) 5x-1

Study the formula for find the zero of a linear polynomial ($-\frac{b}{a}$).

(i) 3x – 5

zero is $-\frac{b}{a}$, b= -5, and 3.

zero = $-\frac{-5}{3}=\frac{5}{3}$ [-x- = +]

(ii) 2x+3

zero = $-\frac{b}{a}$; b=3, a=2

= $-\frac{3}{2}$

(iii) x-2; zero = $-\frac{b}{a}$, b= -2 and a=1

$= \frac{-(-2)}{1} = \frac{2}{1} = 2$

(iv) 5x-1; zero = $-\frac{b}{a}$; b= -1, a=5

$= \frac{-(-1)}{5} = \frac{1}{5}$

Example 2. Find zero of the following polynomials.

1. x^2-5x+6

x=2, we get $x^2-5x+6 = (2)^2-5(2)+6$

$=4-10+6 = 10-10 = 0$;

Put x=3; $x^2-5x+6=(3)^2-5(3)+6$

$=9-15+6=15-15=0$

2 and 3 are the zeroes of the polynomial x^2-5x+6.

2. $3x^2+2x-5$

Solution: Put x = 1, hence we get $3x^2+2x-5$

$=3(1)^2+2(1)-5=3(1)+2-5$

$=3+2-5= 5-5=0$.

then put x = $\frac{-5}{3}$, then $3x^2+2x-5$ is

$3(\frac{-5}{3})^2 + 2(\frac{-5}{3})-5$

$3(\frac{25}{9}) + (\frac{-10}{3})-5$

$(\frac{25}{3})+ (\frac{-10}{3})-5 = \frac{25-10-15}{3} = \frac{25-25}{3} = 0$; LCM=3

1 and $\frac{-5}{3}$ are called the zeros of $3x^2+2x-5$.

Home Work:

1. Find the zeroes of the following.
   (i) 2x-6 (ii) 3x-1 (iii) 5x-5 (iv) 2x+3
2. Find the zeroes of the following.
   (i) $p(x) = x^2+5x+6$
   (ii) $p(x) = x^2+x-2$
   (iii) x^3+3x^2+4x+2
   (iv) if 3 is a zero of the polynomial $2x^2+x+k$, then the value of k = ________

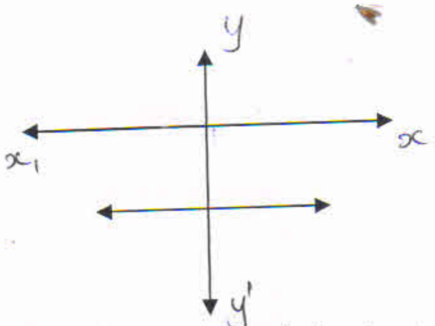
Find the zeros. (Study the definition)

The intersection of the graph of a polynomial with 'x' axis is known as zero of the polynomial.

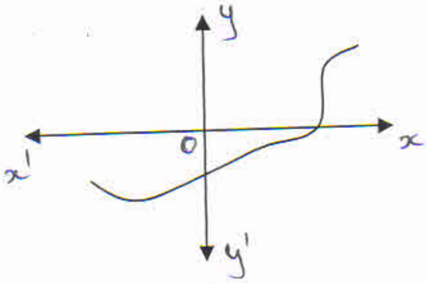
1. The graphs of y=p(x) are given. Find the number of zeroes of each case.

   Ans:

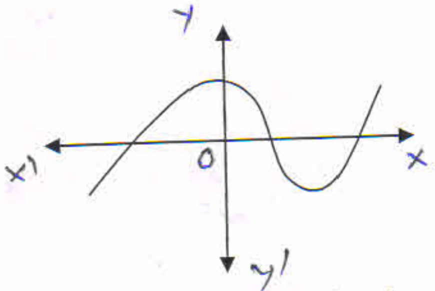
(i) This graph does not intersect the 'x' axis. Therefore this graph p(x) has no zero.



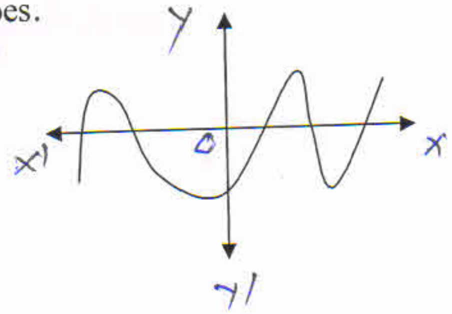
(ii) This graph intersects the 'x' axis at any one point. It has only one zero.



(iii) This graph intersects the 'x' axis at 3 points. This graph has 3 zeroes.



(iv) This graph intersects the 'x' axis at 5 points. Therefore this graph has 5 zeroes.



2. Find the zeroes of the quadratic polynomial $x^2+(a+1)x+b$ are 2 and -3 then find the values of a and b.

Let $p(x) = x^2+(a+1)x+b$

if 2 is a zero of p(x), $p(2)=0$

$p(2) = x^2+(a+1)x+b=0$

$(2)^2+(a+1)(2)+b=0$

$4+2a+2+b=0$

$2a+b+6=0$

$2a+b= -6$ ________________(1)

if -3 is a zero of p(x)

$p(-3)=0$

$p(-3)=(-3)^2+(a+1)(-3)+b=0$

$9-3a-3+b=0$

$6-3a+b=0$

-3a+b=-6 ______________ (2)

(solve using elimination method)

Equation (1) 2a+b= -6

(2) -3a+b= -6

Subtract 5a = 0 So a=0

put a=0 in equation (1) = 2a+b= -6

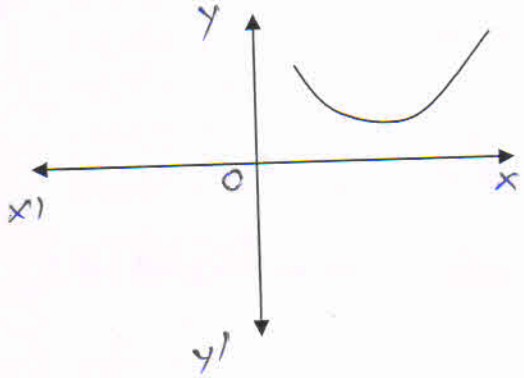
0+b= -6;

b= -6

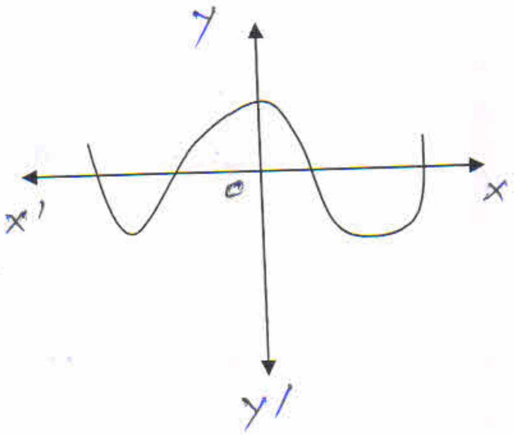
a=0, b= -6

Home work. Find the zeroes.

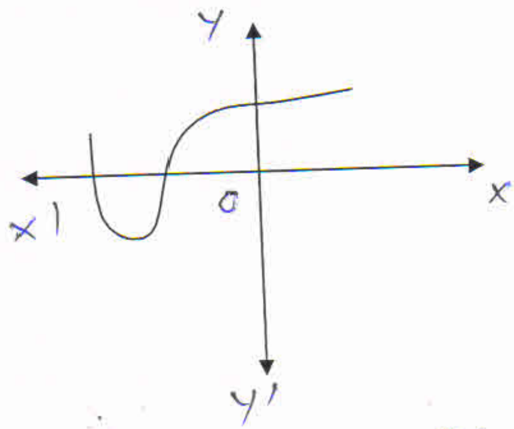
(i)



(iii)



(ii)



Relationship between zeroes and coefficients of a polynomial.

NB: Study these important points first, then try to understand the solutions.

(i) Quadratic polynomial : ax^2+bx+c.

(ii) If α and β are the zeroes.

Sum of the zeroes $\alpha+\beta=\frac{-coefficinet\ of\ x}{coefficient\ of\ x^2}=\frac{-b}{a}$

Product of the zeroes $\alpha\beta=\frac{constant\ term}{coefficient\ of\ x^2}=\frac{c}{a}$

Formation of a quadratic polynomial $x^2-(\alpha+\beta)x+\alpha\beta$

1. Find the zeroes of the quadratic polynomial $x^2+7x+10$ and verify the relationship between the zeroes and the coefficients.

Soln.: $x^2+7x+10 = x^2+5x+2x+10$

$x(x+5)+2(x+5) = (x+5)(x+2)$

Let $x+5=0$ or $x+2=0$; $x=-5$ (or) $x=-2$

Sum of the zeroes = $(-5)+(-2) = -7 = \alpha+\beta$

Product of the zeroes = $(-5) \times (-2) = 10 = \alpha\beta$

Verification:

$a=1, b=7, c=10$

$\alpha+\beta = \frac{-b}{a} = \frac{-7}{1} = -7$

$\alpha\beta = \frac{c}{a} = \frac{10}{1} = 10$

Home work:

Find the zeroes and verify the relationship between the zeroes and coefficients.

i) x^2+3x+2

ii) $4x^2-4x+1$

(iii) x^2-2x-8

(iv) $3x^2-x-4$

(v) $6x^2-7x-3$

NB : (i) Study the given explanations.

(ii) By heart all the formulae.