UDAAN

2025

Polynomials

Mathematics | Lecture - 04

By – Ritik Sir

Topics

to be covered

1. Proof of relationship b/w zeroes and its coefficients
2. Most Important Questions

Aim: 100/100

→ NCERT

→ 


WORK HARD
DREAM BIG
NEVER GIVE UP !!

ax^2+bx+c → α, β

$a \neq 0,\ a, b, c \in R$

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

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

H.W Q

Q px^2+qx+c

Find the value of $\alpha+\beta-2\alpha\beta$.

$\alpha+\beta=-\frac{b}{a}$, $\alpha\beta=\frac{c}{a}$

$\alpha+\beta=-\frac{q}{p}$ $\alpha\beta=\frac{c}{p}$

ax^2+bx+c

$a=p,\ b=q,\ c=c$

$= -\frac{q}{p}-2\left(\frac{c}{p}\right)$

$= -\frac{q}{p}-\frac{2c}{p}$ $= \frac{-q-2c}{p}$

Topic : Zeroes

#Q. Find the zeroes of following quadratic polynomial.

(i) $\sqrt{3}x^2 + 10x + 7\sqrt{3}$

$P = (\sqrt{3})(7\sqrt{3})$, $S = 10$

$P = 21$, $S = 10$

3, 7

3	21
7	7
1	1
	1

(ii) $x^2 + 2\sqrt{2}x - 6$

$\sqrt{3}x^2 + 10x + 7\sqrt{3} = 0$

$\sqrt{3}x^2 + 3x + 7x + 7\sqrt{3} = 0$

$x(\sqrt{3}x + 3) + 7(x + \sqrt{3}) = 0$

$\sqrt{3}x(x + \sqrt{3}) + 7(x + \sqrt{3}) = 0$

$(x + \sqrt{3})(\sqrt{3}x + 7) = 0$

$x + \sqrt{3} = 0$

$x = -\sqrt{3}$

$\sqrt{3}x + 7 = 0$

$x = -\frac{7}{\sqrt{3}}$

Q. $x^2+2\sqrt{2}x-6=0$

$P=-6,\ S=2\sqrt{2}$

$3\sqrt{2}, -\sqrt{2}$

$x^2+2\sqrt{2}x-6=0$

$x^2+3\sqrt{2}x-\sqrt{2}x-6=0$

$x(x+3\sqrt{2})-1(\sqrt{2}x+6)=0$

$x(x+3\sqrt{2})-\sqrt{2}(x+3\sqrt{2})=0$

$(x+3\sqrt{2})(x-\sqrt{2})=0$

$x+3\sqrt{2}=0$

$x=-3\sqrt{2}$

$x-\sqrt{2}=0$

$x=\sqrt{2}$

Topic : Zeroes

#Q. Find the zeroes of the quadratic polynomial $7y^2 - \frac{11}{3}y - \frac{2}{3}$.

-14, 3

$21y^2 - 11y - 2 = 0$

$21y^2 - 14y + 3y - 2 = 0$

$7y(3y-2) + 1(3y-2) = 0$

$(3y-2)(7y+1) = 0$

$y = \frac{2}{3}, -\frac{1}{7}$

$7y^2 - \frac{11}{3}y - \frac{2}{3} = 0$

$\frac{21y^2 - 11y - 2}{3} = 0$

$21y^2 - 11y - 2 = 0$

$P = -42, S = -11$

NCERT EXEMPLAR

3	-42
7	-14
2	2
-1	-1

Topic : Relationship b/w zeroes and coefficients of quadratic polynomial

#Q. If α and β are the zeroes of a quadratic polynomial $f(x) = x^2 - x - 4$ then find the value of $\frac{1}{\alpha} + \frac{1}{\beta} - \alpha\beta$.

[Board Term – I, 2015]

$= \left(\frac{1}{\alpha} + \frac{1}{\beta}\right) - \alpha\beta$

$= \frac{\beta + \alpha}{\alpha\beta} - \alpha\beta$

$= \left(\frac{1}{-4} - (-4)\right)$

$= -\frac{1}{4} + 4$

$= \frac{-1 + 16}{4}$

$= \frac{15}{4}$ Ans.

$ax^2 + bx + c$

$a = 1, b = -1, c = -4$

$\alpha + \beta = -\frac{b}{a}, \quad \alpha\beta = \frac{c}{a}$

$\alpha + \beta = -\frac{(-1)}{1}, \quad \alpha\beta = -4$

$\alpha + \beta = 1$ $\qquad$ $\alpha\beta = -4$

Topic : Relationship b/w zeroes and coefficients of quadratic polynomial

#Q. If α, β are the zeroes of the quadratic polynomial $p(x) = x^2 - (k+6)x + 2(2k-1)$, then the value of k, if $\alpha + \beta = \frac{1}{2}\alpha\beta$ is

[CBSE, Board Term – I, 2021]

A -7

B 7

C -3

D 3

$\alpha+\beta = \frac{1}{2}\alpha\beta$

$k+6 = \frac{1}{2}(4k-2)$

$2(k+6) = 4k-2$

$2k+12 = 4k-2$

$12+2 = 4k-2$

$14 = 2k$

$k = 7$

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

$\alpha\beta = \frac{2(2k-1)}{1}$

$\alpha\beta = 4k-2$

$p(x) = x^2 - (k+6)x + 2(2k-1)$

$ax^2 + bx + c$

$a = 1, b = -(k+6), c = 2(2k-1)$

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

$\alpha+\beta = \frac{-[-(k+6)]}{1}$

$\Rightarrow \alpha+\beta = k+6$

Topic : Relationship b/w zeroes and coefficients of quadratic polynomial

#Q. Find the value of k such that the polynomial $x^2 - (k + 6)x + 2(2k - 1)$ has sum of its zeroes equal to half of their product. [CBSE Delhi Set – I, 2019]

Sum of zeroes = half of product

$$\alpha + \beta = \frac{1}{2}\alpha\beta$$

Topic : Relationship b/w zeroes and coefficients of quadratic polynomial

#Q. If the sum of the zeroes of the quadratic polynomial $3x^2 - kx + 6$ is 3, then find the value of k.

[CBSE SQP, 2020 -21]

Sum = 3

$\alpha + \beta = 3$

$\frac{k}{3} = 3$

$k = 9$ Ans//

$ax^2 + bx + c$

$a = 3, b = -k, c = 6$

$\alpha + \beta = -\frac{b}{a}, \alpha\beta = \frac{c}{a}$

$\alpha + \beta = -\frac{(-k)}{3}, \alpha\beta = \frac{6}{3}$

$\alpha + \beta = \frac{k}{3}$

$\alpha\beta = 2$

Topic : Relationship between zeroes and coefficients of a quadratic polynomial

#Q. Find the product of zeroes of the polynomial $x^2 - 2x$.

$p = 9$

$\alpha\beta = 9$

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

$= \frac{0}{1}$

$\alpha\beta = 0$

$$(a+b)^2 = a^2+b^2+2ab$$

$$(a+b)^2 - 2ab = a^2+b^2$$

$$\alpha^2+\beta^2 = (\alpha+\beta)^2 - 2\alpha\beta$$

Q $2x^2-8x+6$

$P=+12, S=-8$

$-6, -2$

$2x^2-6x-2x+6$

$2x(x-3)-2(x-3)$

$(2x-2)(x-3)$

$2(x-1)(x-3)$

$(x-1)(x-3)$

Q $x^2-21x+108$

$1(x-9)(x-12)$

$x^2-21x+108$

$(x-9)(x-12)$

ax^2+bx+c $\rightarrow \alpha, \beta$ (non-zero Constant)

$ax^2+bx+c = k(x-\alpha)(x-\beta)$

$= k\left[x(x-\beta)-\alpha(x-\beta)\right]$

$= k\left[x^2-\beta x-\alpha x+\alpha\beta\right]$

$= k\left[x^2-(\beta+\alpha)x+\alpha\beta\right]$

$ax^2+bx+c = kx^2-k(\alpha+\beta)x+k\alpha\beta$

$a=k,\ b=-k(\alpha+\beta),\ c=k\alpha\beta$

$b=-a(\alpha+\beta)$ | $c=a\alpha\beta$

$-\frac{b}{a}=\alpha+\beta$ | $\frac{c}{a}=\alpha\beta$

Topic : Relationship b/w zeroes and coefficients of quadratic polynomial

#Q. If α and β are the zeroes of the polynomial $f(x) = x^2 - 6x + k$, find the value of k, such that $\alpha^2 + \beta^2 = 40$.

[Board Term – I, 2015]

$\alpha^2+\beta^2=40$

$(\alpha+\beta)^2-2\alpha\beta=40$

$(6)^2-2(k)=40$

$36-2k=40$

$36-40=2k$

$-4=2k$

$-2=k$

Ans.

$a=1,\ b=-6,\ c=k$

$\alpha+\beta=-\frac{b}{a}$, $\alpha\beta=\frac{c}{a}$

$\alpha+\beta=-\frac{(-6)}{1}$, $\alpha\beta=k$

$\alpha+\beta=6$

Topic : Relationship b/w zeroes and coefficients of quadratic polynomial

#Q. If sum of the squares of zeroes of the quadratic polynomial $f(x) = x^2 - 8x + k$ is 40, find the value of k.

$\alpha^2 + \beta^2 = 40$

Same Question

H.W

Method-2

Q 2, 3

ax^2+bx+c

$\alpha+\beta=-\frac{b}{a}$, $\alpha\beta=\frac{c}{a}$

$2+3=-\frac{b}{a}$, $(2)(3)=\frac{c}{a}$

$\frac{5}{1}=-\frac{b}{a}$, $\frac{6}{1}=\frac{c}{a}$

$a=1k$, $c=6k$, $b=5k$

$b=-5k$

$1kx^2-5kx+6k$

$k[x^2-5x+6]$

Q. 5, -4

ax^2+bx+c

$\alpha+\beta=-\frac{b}{a}$, $\alpha\beta=\frac{c}{a}$

$(5)+(-4)=-\frac{b}{a}$, $(5)(-4)=\frac{c}{a}$

$\frac{1}{1}=-\frac{b}{a}$, $\frac{-20}{1}=\frac{c}{a}$

$a=1k$, $-b=1k$, $c=-20k$

$b=-1k$

$1kx^2-1kx-20k$

$k[x^2-x-20]$

Q. $0, \sqrt{5}$

$\alpha+\beta=-\frac{b}{a}, \alpha\beta=\frac{c}{a}$

ax^2+bx+c

$0+\sqrt{5}=-\frac{b}{a}, (0)(\sqrt{5})=\frac{c}{a}$

$=11kx^2-\sqrt{5}kx+0$

$\frac{\sqrt{5}}{1}=-\frac{b}{a}$, $\frac{0}{1}=\frac{c}{a}$

$=k\left[x^2-\sqrt{5}x\right]$

$a=11k, b=-\sqrt{5}k, c=0k$

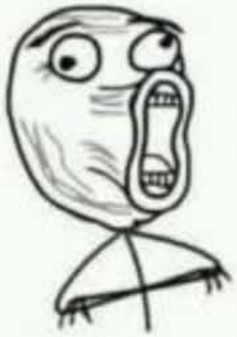
Q no. of polynomials having $\{2, -20\}$ as its zeroes.

(1) 1

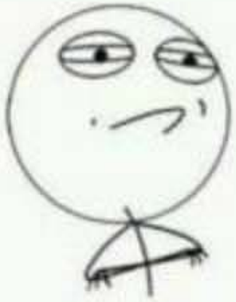
(4) More than 1 ~~4~~

(2) 3

(3) 0



School: 2+2 = 4



Homework: 2+3+4 = 9

Exam: David has 4 apples, his train is 7 minutes early, calculate mass of the sun.

When you solve a maths problem 3 times

and get different answer each time

Homework

DPP

PWTest

THANK YOU