UDAAN

2025

Polynomials

Mathematics | Lecture - 03

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Topics

to be covered

1. Homework Discussion
2. Middle term splitting method
3. Relationship between zeroes and coefficients


WORK HARD
DREAM BIG
NEVER GIVE UP !!

Gym pooof!

Topic : Zeroes

#Q. If one zero of the quadratic polynomial $x^2 + 3x + k$ is 2, then the value of k is

[CBSE, Delhi Set – I, 2020]

A 10

B −10

C −7

D −2

$P(x) = x^2 + 3x + k$

2

$P(2) = 0$

$(2)^2 + 3(2) + k = 0$

$k = -10$

Topic : Zeroes

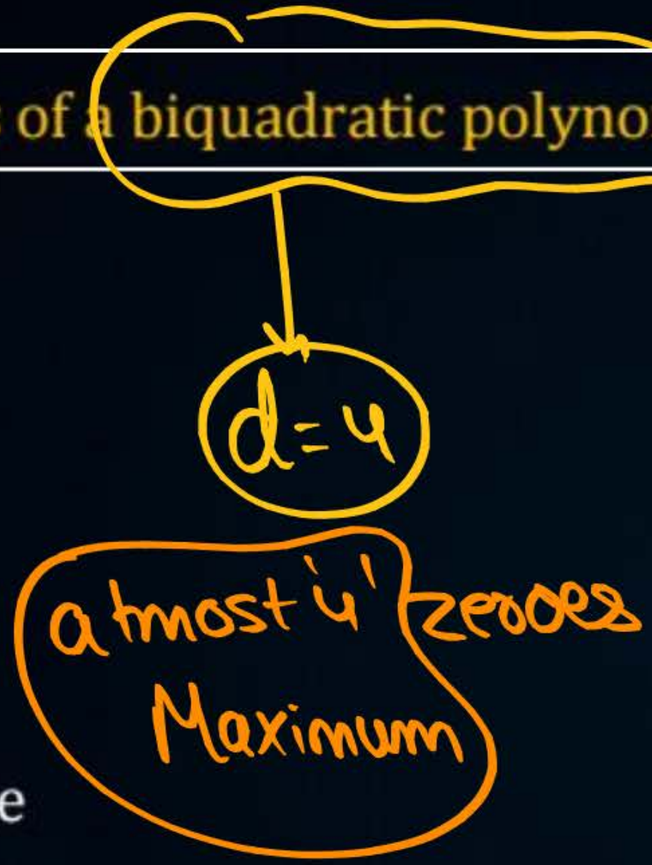
#Q. No. of zeroes of a biquadratic polynomial are

A 1

B 4

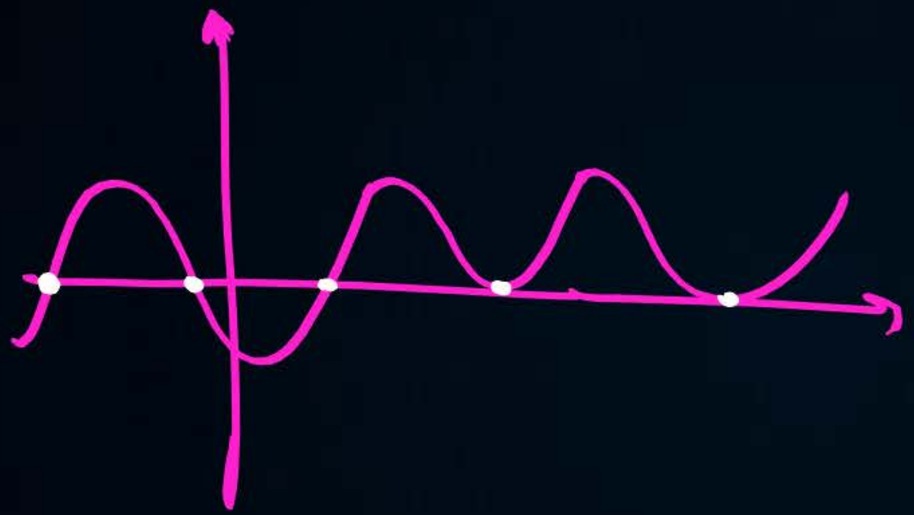
C 0

D None of these



Topic : Zero of a Polynomial

#Q. The graph of a polynomial P(x) cuts the X-axis at 3 points and touches it at 2 other points. The number of zeroes of P(x) is [CBSE, Board Term-I, 2021]



(A) 1

(B) 2

(C) 3

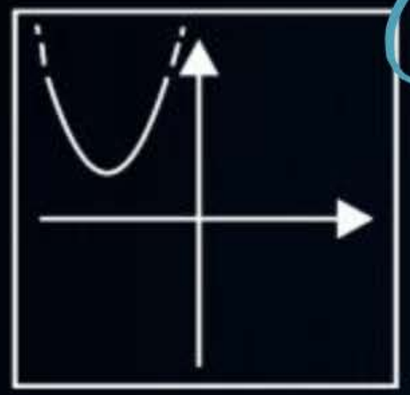
(D) 5

Topic : Zero of a Polynomial

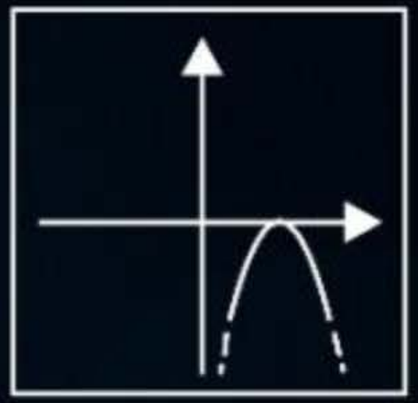
#Q. which of the following is not the graph of a quadratic polynomial?

[NCERT Exemplar]

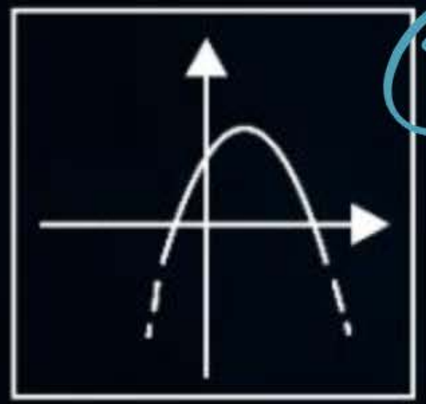
A



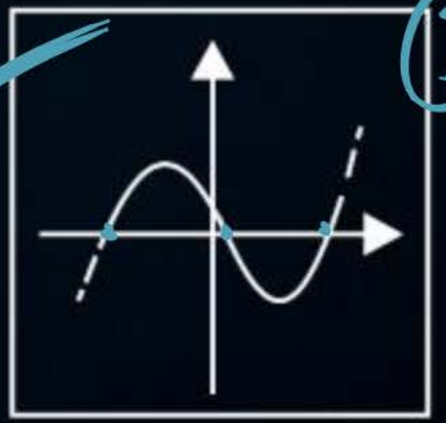
B



C



D

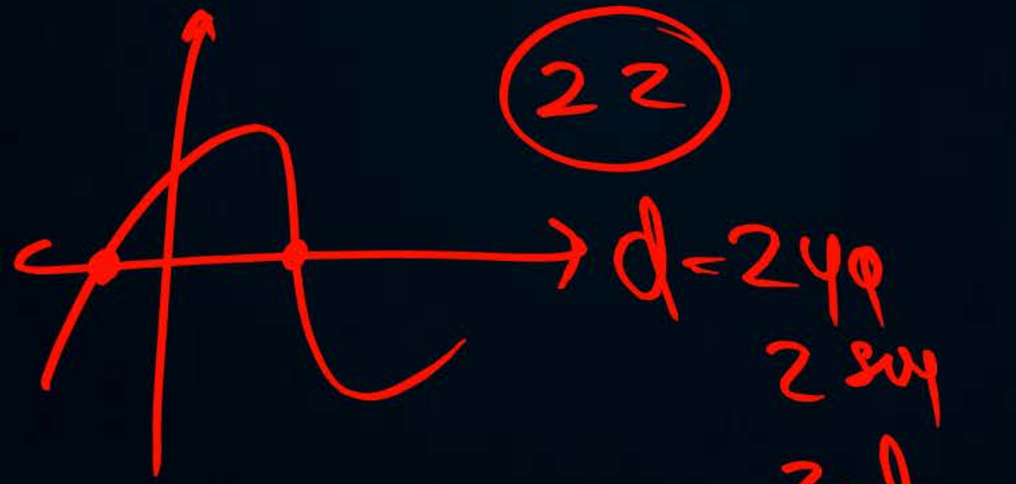


Topic : Zeroes

#Q. Are the following statements 'True' or 'False'? Justify your answer.

(i) If the graph of a polynomial intersects the X-axis at only one point, it cannot be a quadratic polynomial. False

(ii) If the graph of a polynomial intersects the X-axis at exactly two points, it need not be a quadratic polynomial. True



A) True
B) False
C) —
D) —

Middle Term Splitting Method

$\Rightarrow$ $x^2 + 6x + 8$

Product = 8 , Sum = 6

4, 2

$x^2 + 4x + 2x + 8 = 0$

$x(x+4) + 2(x+4) = 0$

$(x+4)(x+2) = 0$

$x+4=0$, $x+2=0$

$x = -4, -2$

zeroes

Middle Term Splitting Method

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$(x+4)(x+2) = 0$

$x+4=0$, $x+2=0$

$x = -4, -2$

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x^2+6x+8

ax^2+bx+c

$a=1$, $b=6$, $c=8$

$\alpha = -4, \beta = -2$

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

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

$-6 = -6$ //

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

$(-4)(-2) = \frac{8}{1}$ $\rightarrow$ $8 = 8$ //

Middle Term Splitting Method

$\Rightarrow \boxed{x^2 + 4x - 21}$

$P = -21, S = 4$

$7, -3$

3	21
7	7
1	1
	1

$x^2 + 4x - 21 = 0$

$x^2 + 7x - 3x - 21 = 0$

$x(x+7) - 3(x+7) = 0$

$(x+7)(x-3) = 0$

$x = -7, 3$

$\alpha \quad \beta$

$\Rightarrow x^2 - 7x + 12$

$P = 12, S = -7$

$-4, -3$

$x^2 - 4x - 3x + 12 = 0$

$x(x-4) - 3(x-4) = 0$

$(x-4)(x-3) = 0$

$x = 4, 3$ $\alpha \quad \beta$

1	−3	2	12
	−3	2	6
1	−4	4	3
	1	−4	4
1	−3	0	0

Middle term splitting for finding zeroes of quadratic polynomial

$3x^2 + 10x + 3$

$P = 9, S = 10$

9, 1

$3x^2 + 9x + 1x + 3 = 0$

$3x(x+3) + 1(x+3) = 0$

$(x+3)(3x+1) = 0$

$x+3=0 \quad 3x+1=0$

$x = -3, \frac{-1}{3}$

$\alpha \quad \beta$

$3x^2 + 10x + 3$

$ax^2 + bx + c$

$a=3, b=10, c=3$

$\alpha = -3, \beta = -\frac{1}{3}$

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

$(-3)+\left(\frac{-1}{3}\right) = -\frac{10}{3}$

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

$(-3)\left(\frac{-1}{3}\right) = \frac{3}{3}$

$-\frac{3}{1} - \frac{1}{3} = -\frac{10}{3}$

$1 = 1$

$\frac{-9-1}{3} = -\frac{10}{3}$

Q $7x - 6 = 2x^2$

$-2x^2 + 7x - 6 = 0$

$P = +12,\ S = 7$

4, 3

$-2x^2 + 4x + 3x - 6 = 0$

$2x(-x+2) + 3(x-2) = 0$

$-2x(x-2) + 3(x-2) = 0$

$(x-2)(-2x+3) = 0$

$x - 2 = 0,\ -2x + 3 = 0$

$x = 2,\ \frac{3}{2}$

$\beta \quad \alpha$

$-2x = -3$

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

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

Middle term splitting for finding zeroes of quadratic polynomial

$7x^2 - 19x - 6$

$28 - 31x - 5x^2$

$P = -42, S = -19$

$-21, 2$

2	42
7	21
3	3
1	1

$7x^2 - 21x + 2x - 6 = 0$

$7x(x-3) + 2(x-3) = 0$

$(x-3)(7x+2) = 0$

$x = 3, -\frac{2}{7}$

α β

Q $28 - 31x - 5x^2 = 0$

$-5x^2 - 31x + 28 = 0$

$P = -140,\ S = -31$

$-35, 4$

2	140
2	70
5	35
7	7
1	1

$-5x^2 - 35x + 4x + 28 = 0$

$-5x(x+7) + 4(x+7) = 0$

$(x+7)(-5x+4) = 0$

$x = -7, \frac{4}{5}$

$\alpha \quad \beta$

Middle Term Splitting Method

$x^2 - 21x + 108$

Hw

$6x^2 + 13x + 6$

equation / Formula.

Relationship between the zeros and coefficients of a Quadratic Polynomial

a, b, c → coefficients.

ax^2+bx+c

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

α = alpha.

β = Beta.

★ $\alpha+\beta = -\frac{b}{a}$

(Sum of zeroes)

★ $\alpha\beta = \frac{c}{a}$

(Product of zeroes)

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

#Q. Find the zeroes of the following quadratic polynomials and verify the relationship between the zeroes and the coefficients.

(i) $4u^2 + 8u$

(ii) $t^2 - 15$

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

(iii) $3x^2 - x - 4 = 0$

$P = -12, S = -1$

$-4, 3$

$ax^2 + bx + c$

$3x^2 - x - 4 = 0$

$3x^2 - 4x + 3x - 4 = 0$

$x(3x - 4) + 1(3x - 4) = 0$

$(3x - 4)(x + 1) = 0$

$x = \frac{4}{3}, -1$

α β

$a = 3, b = -1, c = -4$

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

$\left(\frac{4}{3}\right) + (-1) = \frac{-(-1)}{3}$

$\frac{4}{3} - \frac{3}{3} = \frac{1}{3}$

$\frac{1}{3} = \frac{1}{3}$

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

$\left(\frac{4}{3}\right)(-1) = \frac{-4}{3}$

$\frac{-4}{3} = \frac{-4}{3}$

(ii) $4u^2+8u$ → $4x^2+8x=0$

$(4x)(x+2)=0$

$4x^2+8x$

ax^2+bx+c

$a=4,\ b=8,\ c=0$

$4x=0,\ x+2=0$

$x=0,\ x=-2$

α β

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

$(0)+(-2)=-\frac{8}{4}$

$-2=-2$

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

$(0)(-2)=\frac{0}{4}$

$0=0$

(iii) $x^2-15=0$ → $x^2+0x-15$

$x^2-15=0$ ⇝ ax^2+bx+c

$a=1,\ b=0,\ c=-15$

$x^2-15=0$

$x^2=15$

$x=\pm\sqrt{15}$

$x=\sqrt{15}, -\sqrt{15}$

α β

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

$(\sqrt{15})+(-\sqrt{15})=-\frac{0}{1}$

$0=0$

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

$(\sqrt{15})(-\sqrt{15})=\frac{-15}{1}$

$-15=-15$

ax^2+bx+c

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

$$\alpha+\beta = -\frac{b}{a} = \frac{-(\text{coefficient of } x)}{(\text{coefficient of } x^2)}$$

$$\alpha\beta = \frac{c}{a} = \frac{\text{Constant term}}{\text{coefficient of } x^2}$$

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

#Q. If α and β are the zeroes of a polynomial $x^2 - 4\sqrt{3}x + 3$, then find the value of $\alpha + \beta - \alpha\beta$.

[Board Term – I, 2015]

$= \alpha + \beta - \alpha\beta$

$= 4\sqrt{3} - 3$ Ans//

$x^2 - 4\sqrt{3}x + 3$

$ax^2 + bx + c$

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

$\alpha + \beta = -\frac{(-4\sqrt{3})}{1}$

$\alpha + \beta = 4\sqrt{3}$

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

$\alpha\beta = 3$

HW

Q: px^2+qx+c

Find Value of: $\alpha+\beta-2\alpha\beta = ?$

THANK YOU