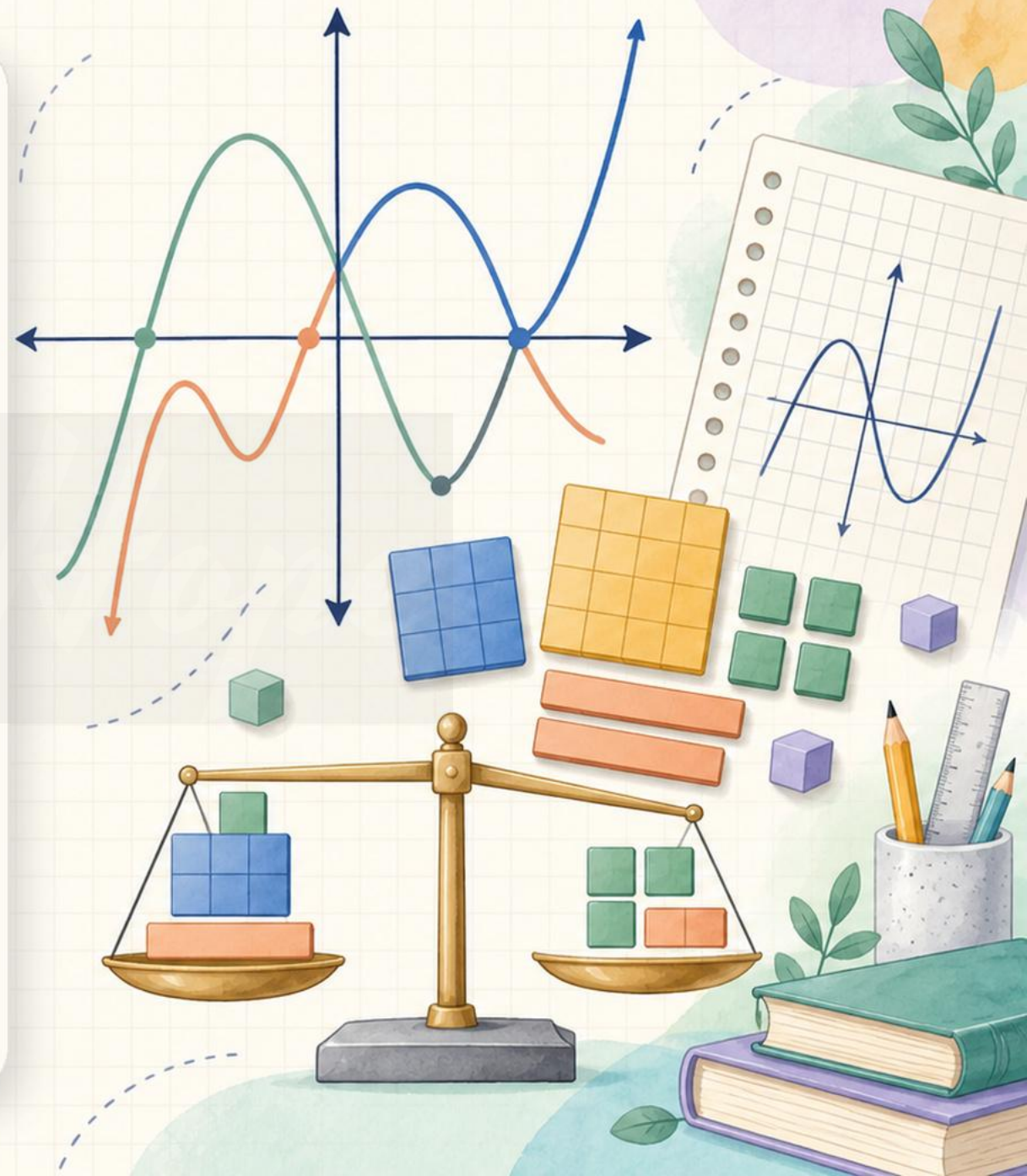


MATHEMATICS • CLASS 10

CHAPTER 2

Polynomials

CHAPTER NOTES



POLYNOMIALS: BASICS AND TYPES

DEFINITION

A polynomial in x is an expression

$$p(x) = a_n x^n + a_{n-1} x^{n-1} + \dots + a_1 x + a_0,$$

where n is a non-negative integer, $a_0, a_1, \dots, a_n$ are real numbers, and $a_n \neq 0$.

- powers of x are whole numbers: $0, 1, 2, \dots$
- a_n is the leading coefficient
- a_0 is the constant term
- degree = highest power with a non-zero coefficient

ANATOMY

Use $p(x) = 3x^3 - 5x^2 + 2x - 7$.

degree 3
(highest power)

$$p(x) = 3x^3 - 5x^2 + 2x - 7$$

Diagram illustrating the components of the polynomial $p(x) = 3x^3 - 5x^2 + 2x - 7$:

- variable x (indicated by an arrow pointing to the x in $3x^3$)
- coefficient 3 (indicated by an arrow pointing to the 3 in $3x^3$)
- coefficient -5 (indicated by an arrow pointing to the -5 in $-5x^2$)
- coefficient 2 (indicated by an arrow pointing to the 2 in $2x$)
- constant term -7 (indicated by an arrow pointing to the -7)

TYPES BY DEGREE

- constant: c , degree 0, $c \neq 0$
- linear: $ax + b$, degree 1
- quadratic: $ax^2 + bx + c$, degree 2
- cubic: $ax^3 + bx^2 + cx + d$, degree 3

In all general forms, $a \neq 0$.

NOT POLYNOMIALS

$$\frac{2}{x} + 1 = 2x^{-1} + 1$$

(negative power)

$$\sqrt{x} + 3 = x^{1/2} + 3$$

(fractional power)

These are not polynomials in x .

VALUE AND ZERO OF A POLYNOMIAL

VALUE $p(a)$

To find $p(a)$, replace x by a and simplify.

Use $p(x) = x^2 - 5x + 6$.

$$p(1) = 1^2 - 5(1) + 6 = 2$$

$$p(2) = 2^2 - 5(2) + 6 = 0$$

$$p(3) = 3^2 - 5(3) + 6 = 0$$

x	$p(x)$
2	$\rightarrow 0$
3	$\rightarrow 0$
1	$\rightarrow 2$

ZERO OF $p(x)$

A real number k is a zero of $p(x)$ if $p(k) = 0$.

For $p(x) = x^2 - 5x + 6$:

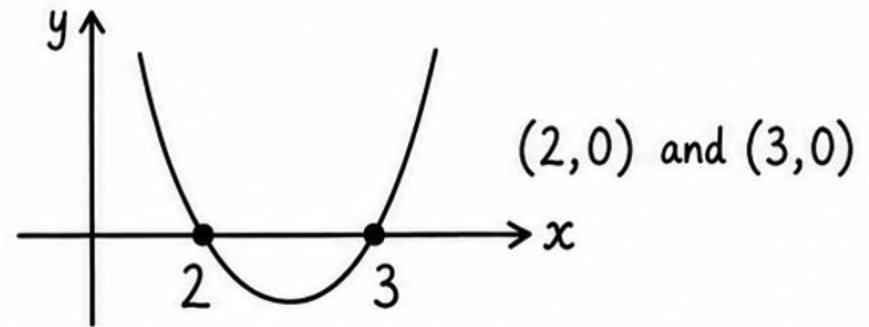
$$p(2) = 0 \quad \text{and} \quad p(3) = 0$$

Therefore, 2 and 3 are zeros.

Factorisation:

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

- The zeros of $p(x)$ are the solutions of $p(x) = 0$.
- On the graph $y = p(x)$, zeros occur where $y = 0$, that is, on the x -axis.

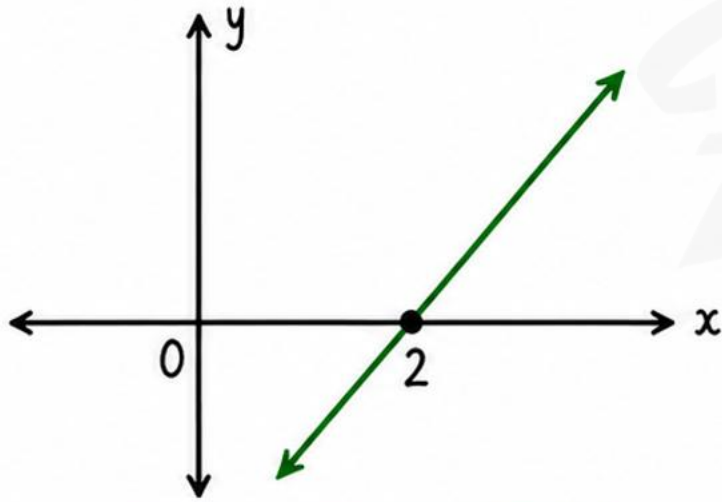


GEOMETRICAL MEANING OF ZEROS

For the graph $y = p(x)$, a zero is the x -coordinate of a point where the graph meets the x -axis.

$$p(x) = x - 2$$

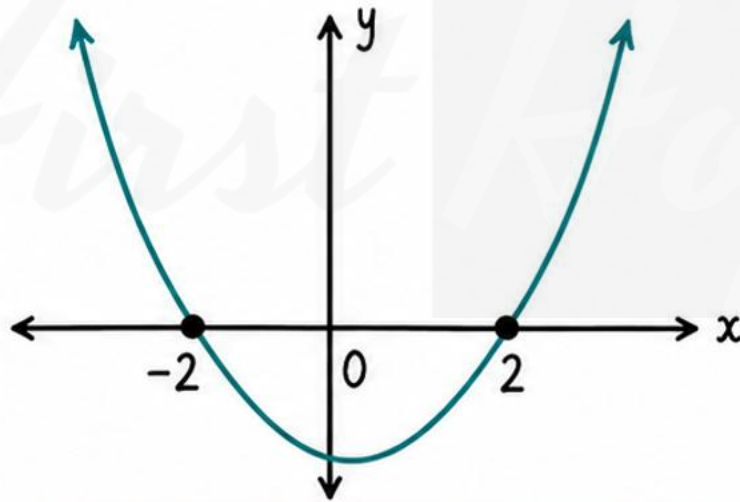
Straight line crosses the x -axis at $(2, 0)$.



one zero, $x = 2$

$$p(x) = x^2 - 4$$

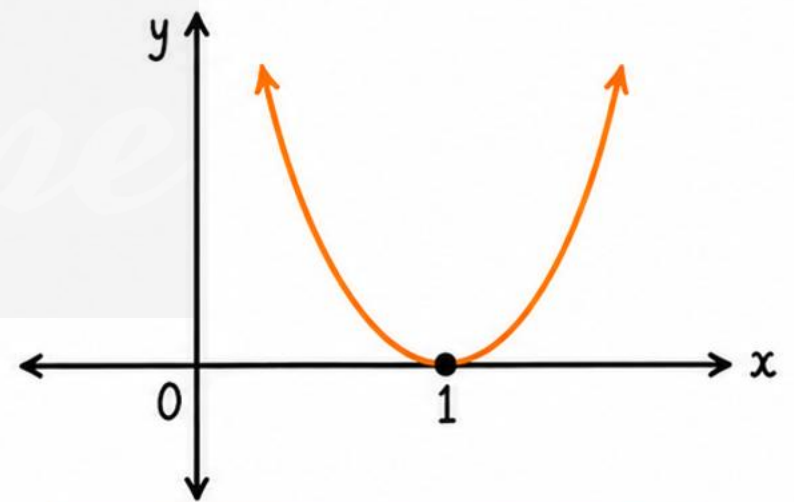
Upward parabola crosses at $(-2, 0)$ and $(2, 0)$.



two zeros, $x = -2$ and $x = 2$

$$p(x) = (x - 1)^2$$

Upward parabola just touches the x -axis at $(1, 0)$.



one repeated zero, $x = 1$

Count distinct x -axis intersection or touching points to count distinct real zeros.



FREE PREVIEW

[Click here to visit our website](#)

SCHOOL NOTES & NCERT SOLUTIONS

Complete notes and
NCERT solutions are
available on
FirstHope app only.



[Scan or click here](#)

Click here to get the app

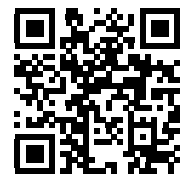


Available on Google Play

JOIN THE FIRSTHOPE COMMUNITY

Join our Telegram channel

Click here to join Telegram



[Scan or click here](#)

@FirstHope_CBSE_Notes

Instagram

@firsthope.school

[Click here to follow >](#)

YouTube channel

@firsthope.school

[Click here to watch >](#)

FirstHope website

firsthope.co.in

[Click here to visit our website >](#)

CBSE / Class 9 / Class 10 / Class 11 / Class 12

Preview notes and NCERT solutions. Full PDFs in the FirstHope app.