

Chapter 2: Polynomials – Easy Notes + Step-by-Step Guide

◆ 1. Types of Polynomials Based on Degree

| Degree | Name of Polynomial | Example |
|--------|--------------------|-----------------|
| 1 | Linear | $2x+3$ |
| 2 | Quadratic | x^2-3x+2 |
| 3 | Cubic | x^3-4x^2+3x-4 |

◆ 2. What are Zeroes of a Polynomial?

☞ A zero of a polynomial $p(x)$ is a number k such that $p(k)=0$

Example:

If $p(x)=x^2-3x-4$, then
 $p(4)=0$ and $p(-1)=0$

✓ So, -1 and 4 are **zeroes** of the polynomial.

◆ 3. Geometrical Meaning of Zeroes

- **Linear polynomial (degree 1):**

Graph is a **straight line**

☞ It cuts x-axis at **1 point** → 1 zero

- **Quadratic polynomial (degree 2):**

Graph is a **parabola**

☞ It can cut the x-axis at:

- **2 points** → 2 zeroes
- **1 point** (touches) → 1 zero
- **No point** (never touches) → No real zero

- **Cubic polynomial (degree 3):**

Graph can cut the x-axis at **up to 3 points**

☞ So, can have up to **3 zeroes**

◆ 4. Finding Zeroes from a Graph

- Just **look at x-axis intersections** of the graph.
- The **x-coordinates where the graph cuts the x-axis** are the zeroes.

Example from Graph:

If a curve cuts the x-axis at $x = -2$, $x = 0$, and $x = 3$,
then the zeroes are: **-2, 0, 3**

◆ **5. Relationship Between Zeroes and Coefficients**

For **Quadratic Polynomial**:

Let the polynomial be ax^2+bx+c
If zeroes are α and β , then:

| Relationship | Formula |
|--------------|---|
| Sum | $\alpha + \beta = -\frac{b}{a}$ $\alpha + \beta = -ab$ |
| Product | $\alpha \cdot \beta = \frac{c}{a}$ $\alpha \cdot \beta = ac$ |

Example:

Polynomial: $x^2+7x+10$
Factorized: $(x+2)(x+5)$
Zeroes: -2, -5
✓ Sum = $-2 + (-5) = -7 = -b/a$
✓ Product = $(-2) \times (-5) = 10 = c/a$

For **Cubic Polynomial** ax^3+bx^2+cx+d :

Let zeroes be α, β, γ

| Relationship | Formula |
|--------------|---|
| Sum | $\alpha + \beta + \gamma = -\frac{b}{a}$ $\alpha + \beta + \gamma = -ab$ |
| Sum of pairs | $\alpha\beta + \beta\gamma + \gamma\alpha = \frac{c}{a}$ $\alpha\beta + \beta\gamma + \gamma\alpha = ac$ |
| Product | $\alpha\beta\gamma = -\frac{d}{a}$ $\alpha\beta\gamma = -ad$ |

◆ 6. How to Form a Polynomial Given Zeroes

👉 Use formula:

For zeroes α and β :

$$\text{Polynomial} = x^2 - (\alpha + \beta)x + \alpha\beta$$

Example:

Given zeroes: 2 and 3

👉 Polynomial: $x^2 - 5x + 6$

📌 Frequently Asked Exam Questions

| Type of Question | Chapter Portion |
|--|-----------------------|
| Find zeroes of quadratic polynomial and verify | Relationship formulas |
| Form a quadratic polynomial with given zeroes | Using sum/product |
| Number of zeroes from a graph | Graph-based questions |
| Prove sum and product of zeroes match coefficients | Coefficient formulas |
| Explain meaning of zeroes geometrically (1, 2, none) | Graphical meaning |