

The Quadratic Formula and Discriminant

Chapter 4: Quadratic Equations · Topic 2

Key Concept

If the discriminant is positive, the equation has two distinct real roots; if it equals zero, the equation has exactly one repeated real root (a double root); and if it is negative, the equation has no real roots (only complex roots, not covered at this level). This formula provides a universal, reliable method for solving quadratics that works even when the roots are irrational or when factorisation would be very difficult to find by inspection.

Quick Revision Notes

- Quadratic formula: $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$, solves any quadratic equation.
- Discriminant = $b^2 - 4ac$, determines the nature of the roots.
- Positive discriminant: two distinct real roots. Zero: one repeated root. Negative: no real roots.
- The quadratic formula works even when factorisation is difficult or the roots are irrational.

Practice Questions

- 1 Find the discriminant of $2x^2 + 3x - 5 = 0$ and state the nature of its roots.
- 2 Use the quadratic formula to solve $x^2 - 4x + 3 = 0$.
- 3 Explain what a discriminant of exactly zero tells us about the roots of a quadratic equation.