

Algebra 9 — Nature of Quadratic Graphs

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ON THE LCHL PAST PAPERS · 2025 P1 Q6(b)(i) (main sitting, 10 marks) · 2025 P1 Q6(b)(ii) (main sitting, 10 marks) · 2022 P1 Q1(a) (main sitting, 10 marks) · 2022 P1 Q1(b) (main sitting, 5 marks) · 2020 P1 Q1(a)(iii) (main sitting, 5 marks) · 2017 P1 Q1(c)(i) (main sitting, 5 marks)

How to use this worksheet: these are the exact questions worked in this tutorial, in order. Try each one yourself first — the time it is posed in the video is shown, so you can pause before Paul solves it. Final answers are at the back; the full method is in the video.

Formula used

$$\text{Discriminant: } b^2 - 4ac$$

Not printed on its own — read it out of the roots formula on page 20 of the log tables. > 0 : two distinct real roots; $= 0$: two equal; ≥ 0 : two real; < 0 : no real roots.

Worked examples (in the video)

Intro. Find the discriminant of $x^2 - 4x - 9 = 0$ (worked 00:14-02:07).

Four scenarios. The vocabulary rubric — matching exam phrasing to the discriminant condition (worked 02:12-06:17).

Example 1. $x^2 + 4x + k = 0$ — find the range of k for two real roots (worked 06:21-08:30).

Questions

Q1. Find the range of values of t for which $x^2 + 8x + t = 0$ has **two real roots**.

Posed at 08:39 in the tutorial.

Q2. Find the **values** of t for which $4x^2 + tx + 25 = 0$ has **two equal roots**.

Posed at 08:48 in the tutorial.

Q3. Find the range of values of t for which $x^2 - x(2t + 2) + (5t + 1) = 0$ has **no real roots**.

Posed at 08:54 in the tutorial.

Answers

You can find the final answers to these questions below — pause the video and check yourself; the worked method is in the tutorial.

Intro. $b^2 - 4ac = 16 + 36 = 52$

Four scenarios. Two distinct real $\rightarrow > 0$; two equal $\rightarrow = 0$; two real $\rightarrow \geq 0$; no real roots $\rightarrow < 0$

Example 1. $k \leq 4$

Q1. $t \leq 16$

Q2. $t = 20$ or $t = -20$

Q3. $0 < t < 3$

Overlaps with these tutorials

Algebra 6 — Inequalities. Load-bearing for Q3: the discriminant condition becomes a quadratic inequality solved the algebra-6 way. Do it first.

Algebra 2 — Factorising Quadratics. DOTS and common-factor extraction finish Q2 and Q3.

Algebra 12 — Nature of Cubic Roots. The same four-scenario rubric, applied one level up after a long division.