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Curved Graphs

Solutions & Answer Key

Full worked solutions, drawn graphs, marking scheme & answer key

IGCSE Mathematics

The Panda Math Tutor

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Companion to the *Student Worksheet*

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Note

About this booklet. These are the complete solutions to every question in the *Curved Graphs — Student Worksheet*. Question numbers match exactly (QG1–QG7, CS1–CS7, RG1–RG7, GS1–GS6, CE1–CE6, GT1–GT4, DF1–DF9, TP1–TP7, the Mixed Review MR1–MR10, and the examination questions Q1–Q8).
Every graph the student is asked to draw is reproduced here in full, so the shape and the key points can be compared directly against their own drawing. Part V collects the common mistakes to watch for, and Part VI is a quick answer key for fast marking.

4 Part IV — Complete Solutions

Note

Reading a value *from a graph* is only ever an estimate, so answers to graphical questions are given to 1 decimal place and a small tolerance should be allowed when marking. Answers obtained by *differentiating* are exact.

4.1 Solutions — Quadratic Graphs and Their Features

Solution QG1

The direction depends only on the sign of a; the y-intercept is the constant term c.

(a) $a = 2 > 0$: opens **upward** (minimum). y-intercept $(0, 3)$.

(b) $a = -1 < 0$: opens **downward** (maximum). y-intercept $(0, -6)$.

(c) Rewriting as $y = -3x^2 + 5$, we have $a = -3 < 0$: opens **downward**. y-intercept $(0, 5)$.

Solution QG2

x	-3	-2	-1	0	1	2	3
y	5	0	-3	-4	-3	0	5

Roots: $x = -2$ and $x = 2$. **y-intercept:** $(0, -4)$.
The table is symmetrical about $x = 0$, which is the axis of symmetry.

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Solution QG3

Here $a = 1$, $b = -6$, $c = 5$.

$$x = -\frac{b}{2a} = -\frac{-6}{2(1)} = 3.$$

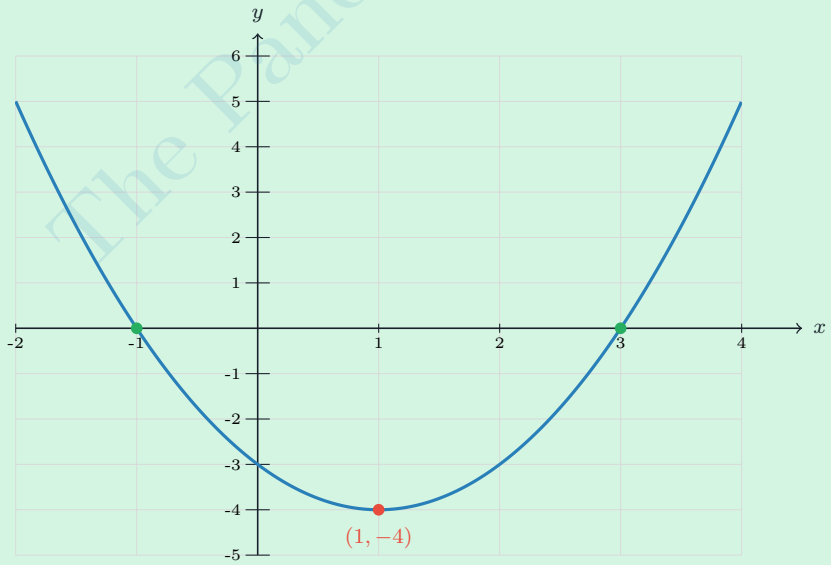
Substituting: $y = 3^2 - 6(3) + 5 = 9 - 18 + 5 = -4$.
Vertex: $(3, -4)$. **Axis of symmetry:** $x = 3$.
Check: $y = (x-1)(x-5)$, so the roots are 1 and 5, whose midpoint is indeed 3. ✓

Solution QG4

(a) Building the table row by row:

x	-2	-1	0	1	2	3	4
x^2	4	1	0	1	4	9	16
$-2x$	4	2	0	-2	-4	-6	-8
-3	-3	-3	-3	-3	-3	-3	-3
y	5	0	-3	-4	-3	0	5

(b) The graph:



(c) Vertex $(1, -4)$; **roots** $x = -1$ **and** $x = 3$.
Since $x^2 - 2x - 3 = (x+1)(x-3)$, the roots read from the graph are exact.

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Preview ends here

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