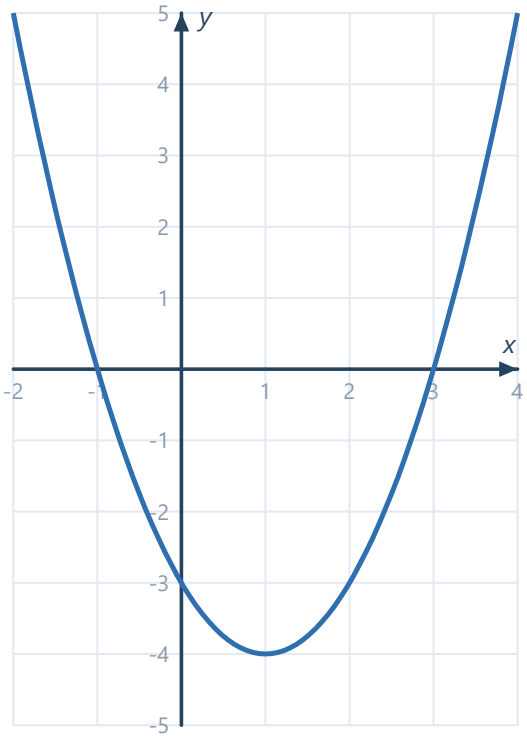
GCSE Maths: Roots, intercepts, symmetry and turning points (Higher): answers

GCSE Maths - Quadratic and Other Graphs - Higher - Lesson 13.2

Answers. Final answers to the worksheet questions. Full step-by-step solutions for every question are free at **websink.site/gcse/maths/ch13-quadratic-other-graphs/higher/roots-intercepts-symmetry-and-turning-points/**

Exercise 13B Reading quadratic graphs Non-calculator

1 Here is the graph of $y = x^2 - 2x - 3$. Use it to write down (a) the roots, (b) the y-intercept, (c) the coordinates of the turning point, (d) the equation of the line of symmetry.



(a) the roots

Answer: $x = -1$ or 3

(b) the y-intercept

Answer: y-intercept = −3

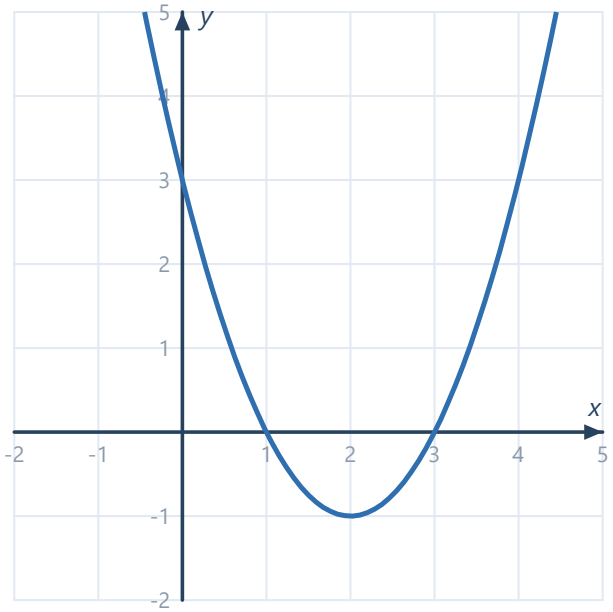
(c) the turning point

Answer: (1, −4)

(d) the line of symmetry

Answer: $x = 1$

2 Here is the graph of $y = x^2 - 4x + 3$. (a) Write down the roots. (b) Write down the coordinates of the turning point. (c) Is the turning point a maximum or a minimum? Give a reason.



(a) the roots

Answer: $x = 1$ or 3

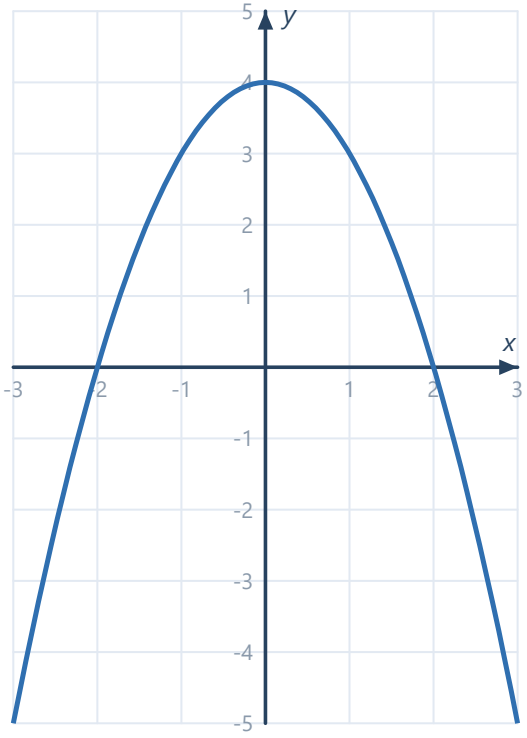
(b) the turning point

Answer: $(2, -1)$

(c) maximum or minimum?

Answer: Minimum

3 **Here is the graph of $y = 4 - x^2$. Write down (a) the y-intercept, (b) the roots, (c) the maximum value of y.**



(a) the y-intercept

Answer: y-intercept = 4

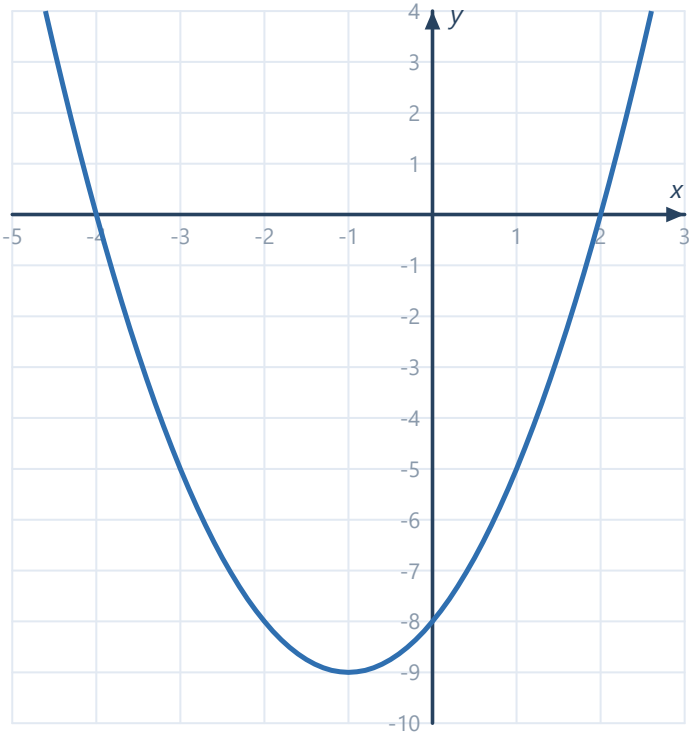
(b) the roots

Answer: $x = -2$ or 2

(c) the maximum value of y

Answer: maximum value of y = 4

4 **Here is the graph of $y = x^2 + 2x - 8$. (a) Write down the roots. (b) Write down the coordinates of the turning point. (c) Write down the minimum value of y. (d) Write down the equation of the line of symmetry.**



(a) the roots

Answer: $x = -4$ or 2

(b) the turning point

Answer: $(-1, -9)$

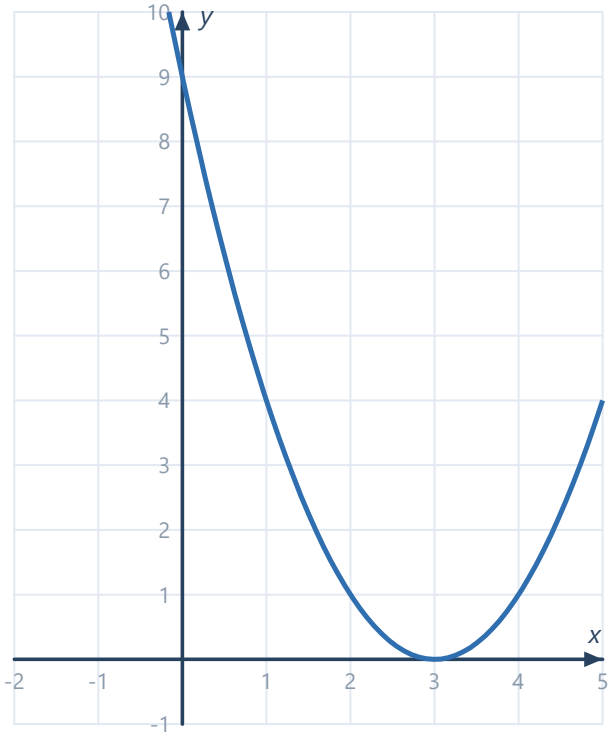
(c) the minimum value of y

Answer: minimum value of y = −9

(d) the line of symmetry

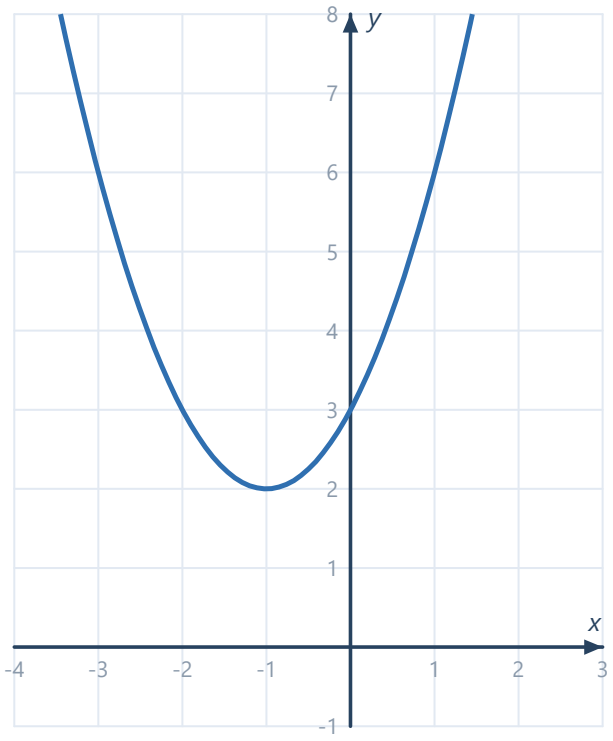
Answer: $x = -1$

5 **The graph of $y = x^2 - 6x + 9$ touches the x-axis at one point. Write down the root of the equation $x^2 - 6x + 9 = 0$.**



Answer: $x = 3$

6 Here is the graph of $y = x^2 + 2x + 3$. How many roots does it have? Give a reason for your answer.



Answer: No roots (the curve never meets the x-axis)

7 Use the roots to write down the equation of the line of symmetry of each curve.

(a) Roots at 1 and 5

Answer: x = 3

(b) Roots at −4 and 2

Answer: x = −1

(c) Roots at −7 and −1

Answer: x = −4

8 Work out the roots of each quadratic **without** drawing a graph. (Put $y = 0$.)

(a) $y = (x - 3)(x + 2)$

Answer: $x = 3$ or -2

(b) $y = (x + 1)(x - 5)$

Answer: $x = -1$ or 5

(c) $y = x(x - 4)$

Answer: $x = 0$ or 4

(d) $y = x^2 - 25$

Answer: $x = \pm 5$

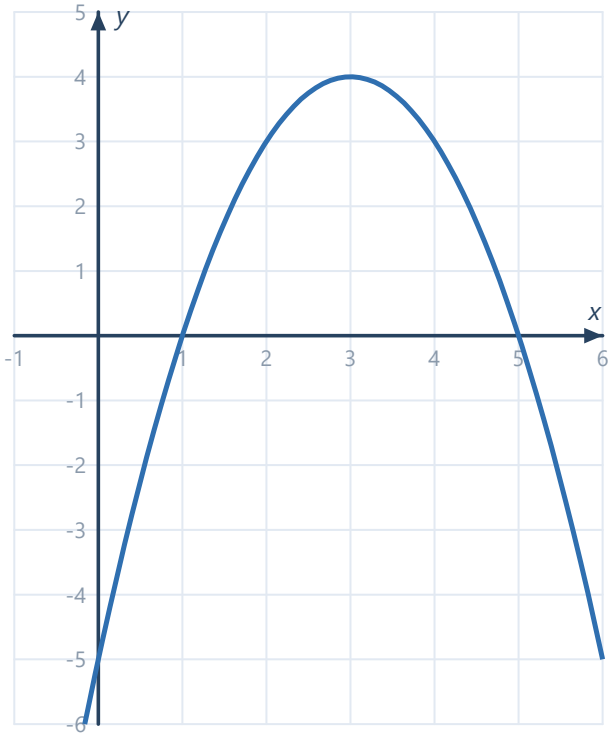
(e) $y = x^2 - 49$

Answer: $x = \pm 7$

(f) $y = (x - 6)(x - 6)$

Answer: $x = 6$

9 Here is the graph of $y = -x^2 + 6x - 5$. Write down (a) the roots, (b) the coordinates of the turning point, (c) the maximum value of y, (d) the equation of the line of symmetry.



(a) the roots

Answer: $x = 1$ or 5

(b) the turning point

Answer: (3, 4)

(c) the maximum value of y

Answer: maximum value of y = 4

(d) the line of symmetry

Answer: $x = 3$

10 **The graph of $y = x^2 - 6x + 5$ crosses the x-axis at (1, 0) and (5, 0). Work out the coordinates of the turning point.**

Answer: (3, −4)

11 **A parabola crosses the x-axis at (−3, 0) and (7, 0). It is n-shaped and its highest point has y-value 25. Write down (a) the equation of its line of symmetry, (b) the coordinates of its turning point.**

(a) the line of symmetry

Answer: x = 2

(b) the turning point

Answer: (2, 25)

12 **Sam says: "A parabola with roots at 2 and 6 has its line of symmetry at $x = 8$." Is Sam right? Explain.**

Answer: No. The line of symmetry is x = 4

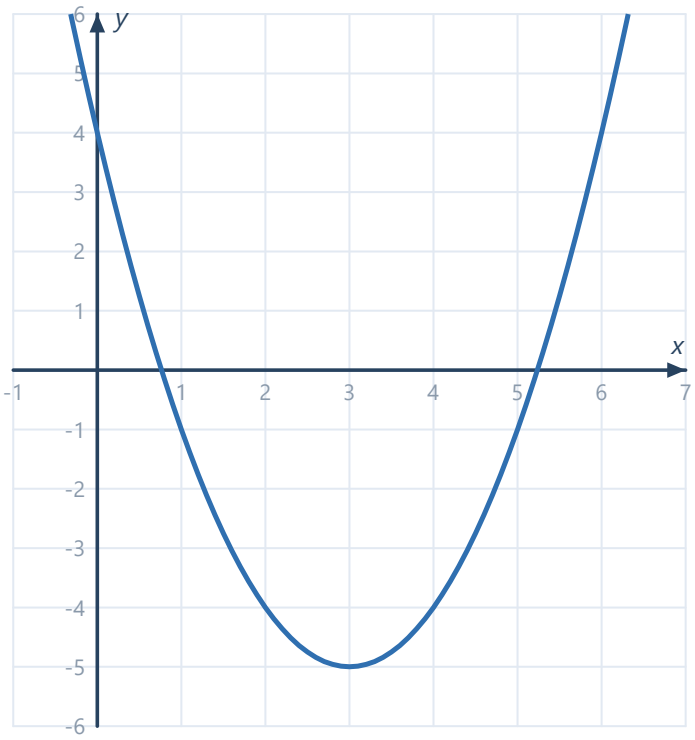
13 **Explain why a quadratic graph can have no roots, one root or two roots, but it can never have three roots.**

Answer: A parabola can cross the x-axis at most twice

14 Priya says the turning point of $y = x^2 - 2x - 3$ is $(-4, 1)$. Explain why she is wrong and write down the correct coordinates.

Answer: $(1, -4)$

15 Here is the graph of $y = x^2 - 6x + 4$. Use the graph to find (a) the roots, to 1 decimal place, (b) the coordinates of the turning point.



(a) the roots (1 d.p.)

Answer: $x \approx 0.8$ or 5.2 (accept answers within 0.1)

(b) the turning point

Answer: $(3, -5)$

16 Factorise to find the roots of each quadratic.

(a) $y = x^2 - 5x + 6$

Answer: $x = 2$ or 3

(b) $y = x^2 + x - 12$

Answer: $x = -4$ or 3

(c) $y = x^2 - 7x + 10$

Answer: $x = 2$ or 5

(d) $y = x^2 + 6x + 9$

Answer: $x = -3$

17 **The graph of $y = x^2 - 2x - 3$ has its turning point at (1, −4). (a) Write down the coordinates of the point where the curve crosses the y-axis. (b) Use symmetry to write down the coordinates of another point on the curve with the same y-value. (c) Explain how you used symmetry.**

(a) the y-intercept

Answer: (0, −3)

(b) another point with y = −3

Answer: (2, −3)

(c) Explain.

Answer: Mirror image in x = 1

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