

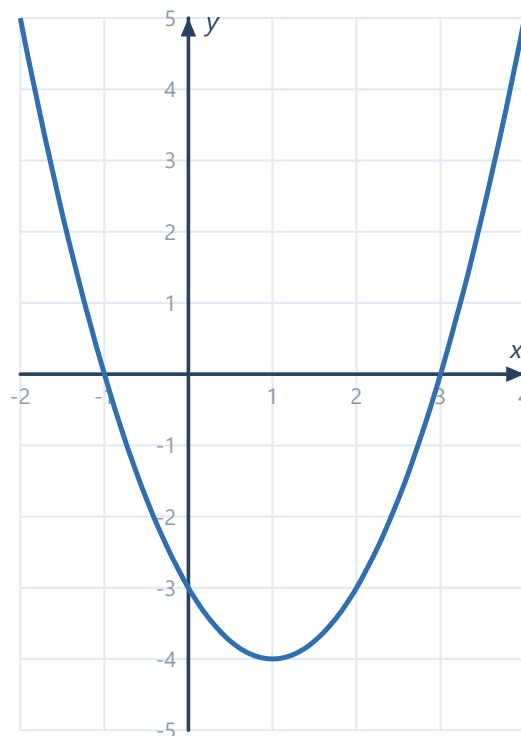
GCSE Maths: Roots, intercepts, symmetry and turning points (Foundation): answers

GCSE Maths - Quadratic and Other Graphs - Foundation - 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/foundation/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

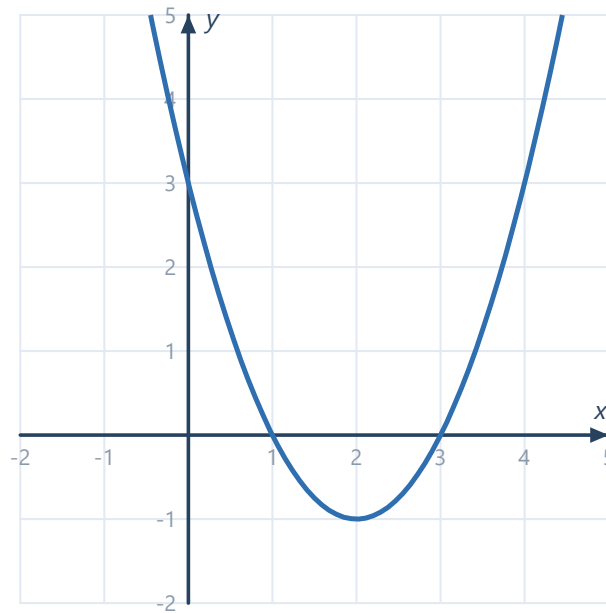
- (c) the turning point

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

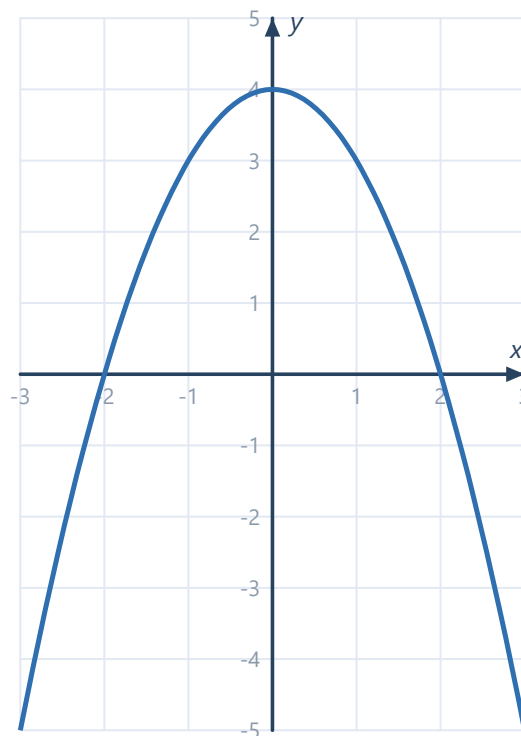
(b) the turning point

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

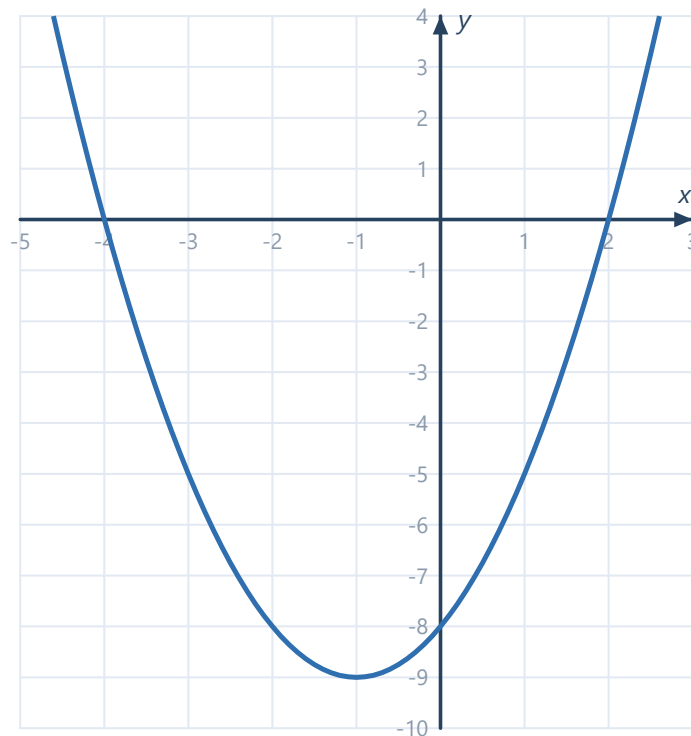
(b) the roots

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: $(-1, -9)$

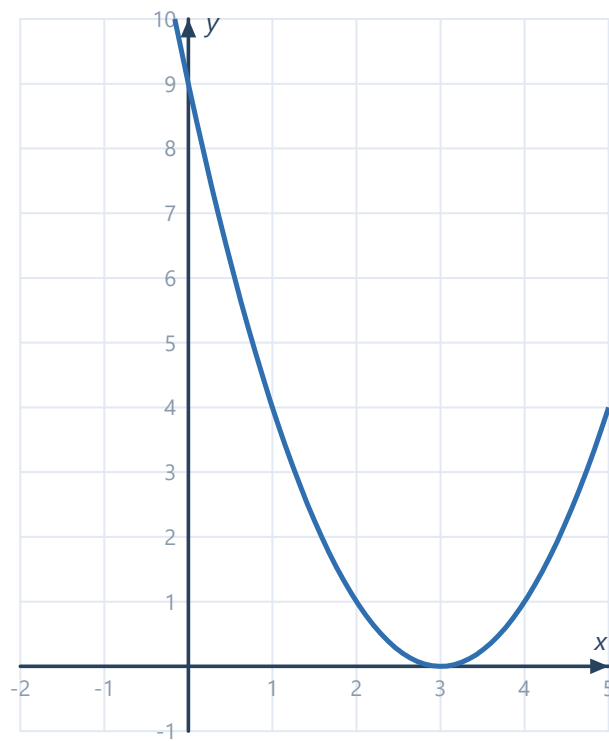
(c) the minimum value of y

Answer: minimum value of $y = -9$

(d) the line of symmetry

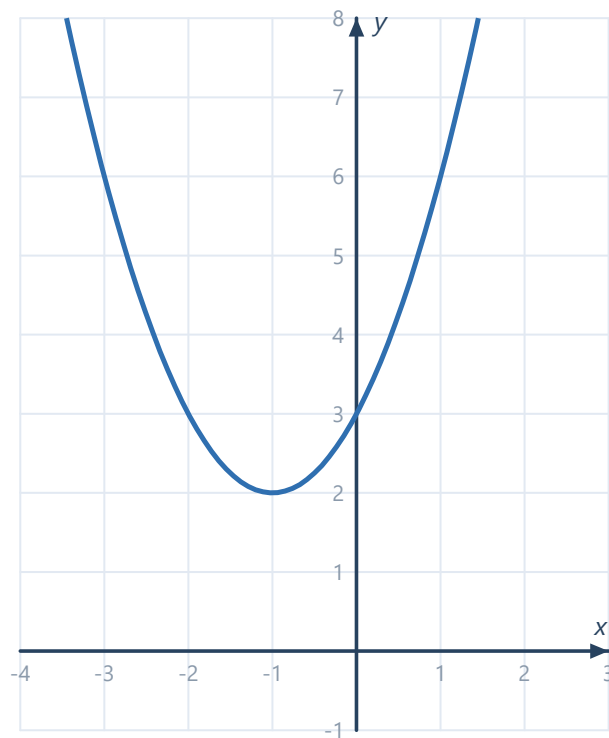
Answer: $x = -1$

- 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: $x = \pm 5$

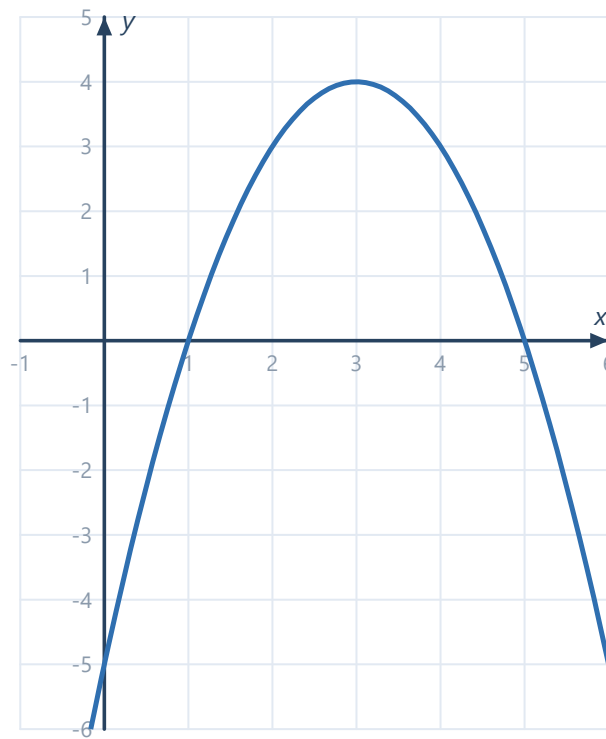
- (e) $y = x^2 - 49$

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** 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 $x = 1$