Quadratics and Parabolas - Practice test 1

16 questions | 49 marks | 55 minutes

A balanced paper covering expressions, equations, graphs and practical interpretation.

Equivalent correct methods earn the corresponding marks.

1. Expand $(x+6)(x-2)$. [2 marks]

$x^2-2x+6x-12=x^2+4x-12$.

Answer: $x^2+4x-12$

2. Factorise $x^2+3x-28$. [2 marks]

$7(-4)=-28$ and $7-4=3$.

Answer: $(x+7)(x-4)$

3. Factorise $2x^2-9x+4$. [3 marks]

Split $-9x$ as $-8x-x$, then group.

Answer: $(2x-1)(x-4)$

4. Solve $x(x-5)=0$. [2 marks]

One factor must be zero.

Answer: $x=0$ or $x=5$

5. Solve $x^2-7x+10=0$. [3 marks]

$(x-2)(x-5)=0$.

Answer: $x=2$ or $x=5$

6. Complete the square: x^2-6x+2. [3 marks]

$x^2-6x+9-9+2=(x-3)^2-7$.

Answer: $(x-3)^2-7$

7. Use the quadratic formula to solve $2x^2 + x - 4 = 0$ exactly. [3 marks]

$a = 2, b = 1, c = -4$.

The discriminant is $1 + 32 = 33$.

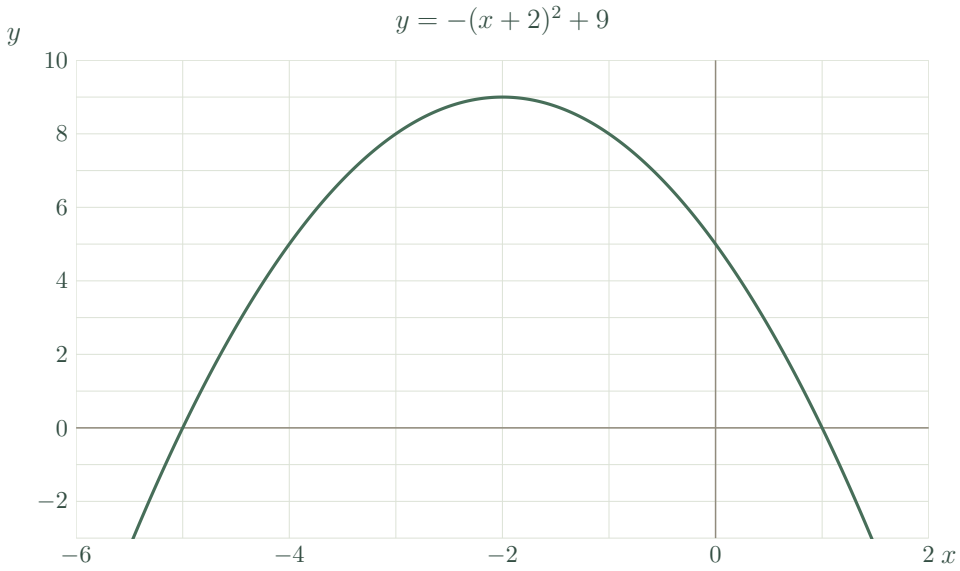
Answer: $x = \frac{-1 \pm \sqrt{33}}{4}$

8. How many real roots does $3x^2 + 2x + 5 = 0$ have? Justify your answer. [2 marks]

$\Delta = 2^2 - 4(3)(5) = -56 < 0$.

Answer: No real roots.

9. For $y = -(x+2)^2 + 9$, find the requested features. [5 marks]



(a) State the vertex and axis of symmetry. [2 marks]

The square is zero at $x = -2$.

Answer: $(-2, 9)$ and $x = -2$

(b) Find all intercepts. [3 marks]

$(x+2)^2 = 9$ gives $x = -5, 1$; $y(0) = 5$.

Answer: $(-5, 0), (1, 0), (0, 5)$

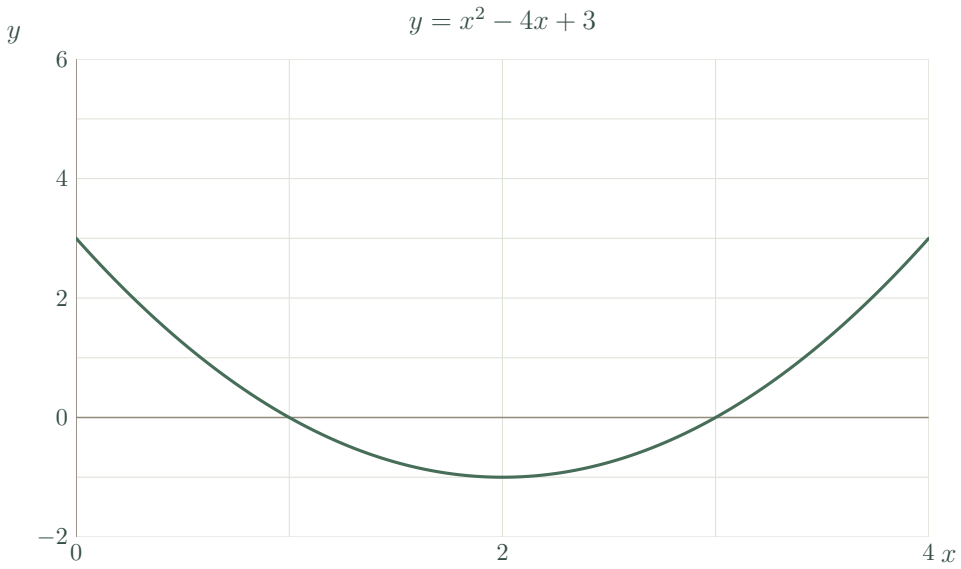
10. Write $y = x^2 + 2x - 8$ in factored and vertex forms. [4 marks]

The factors use 4 and -2.

Add and subtract 1 to complete the square.

Answer: $y = (x + 4)(x - 2) = (x + 1)^2 - 9$

11. Sketch $y = x^2 - 4x + 3$. Label the vertex and all intercepts. [4 marks]



$y = (x - 1)(x - 3) = (x - 2)^2 - 1$.

Answer: Vertex $(2, -1)$; roots $1, 3$; y-intercept $(0, 3)$; upward opening.

12. Use the table to locate the positive root of $x^2 - 7 = 0$ between two listed values. [3 marks]

x	2.64	2.65
$x^2 - 7$	-0.0304	0.0225

The polynomial changes from negative to positive between the two inputs.

Answer: $2.64 < x < 2.65$

13. Find the intersection points of $y = x^2 - 4$ and $y = 3x$. [4 marks]

$x^2 - 3x - 4 = (x - 4)(x + 1) = 0$.

Use $y = 3x$ to find each height.

Answer: $(-1,\ -3)$ and $(4, 12)$

14. A rectangle is 2 cm longer than it is wide. Its area is 48 cm². Find its dimensions. [3 marks]

$x(x + 2) = 48$ gives $(x + 8)(x - 6) = 0$.

Use the positive width 6.

Answer: 6 cm by 8 cm.

15. Find k so that $x^2 - 8x + k = 0$ has one repeated real root. [3 marks]

$64 - 4k = 0$, so $k = 16$.

Answer: $k = 16$

16. A student solves $x^2 = 7x$ by dividing by x and reports only $x = 7$. Explain what was lost and give all solutions. [3 marks]

$x(x - 7) = 0$.

Both values satisfy the original equation.

Answer: $x = 0$ and $x = 7$; dividing by x lost the zero solution.