

Quadratic Functions Practice, Mathematics 20-1

This worksheet reinforces the analysis of quadratic functions in vertex form and standard form, including vertex, axis of symmetry, direction of opening, intercepts, domain, and range ([Outcome](#), [Outcome](#)). It also covers solving quadratic equations, linear-quadratic systems, and quadratic inequalities ([Outcome](#), [Outcome](#), [Outcome](#)).

Exercises

1. For each quadratic function written in vertex form, state the vertex, the axis of symmetry, and the direction of opening ([Outcome](#)).

Function	Vertex	Axis of Symmetry	Direction of Opening
$y = 3(x - 2)^2 + 5$	_____	_____	_____
$y = -(1/2)(x + 4)^2 - 1$	_____	_____	_____
$y = x^2 + 7$	_____	_____	_____

2. Consider the quadratic function $y = x^2 - 6x + 5$.

a) Rewrite the function in vertex form by completing the square.

b) State the vertex: _____

c) Determine the x-intercepts by factoring: _____

d) State the y-intercept: _____

e) State the domain: _____

f) State the range: _____

3. A ball is thrown upward from a height of 1 m with an initial velocity of 20 m/s. Its height in metres after t seconds is modelled by $h(t) = -5t^2 + 20t + 1$. Determine, to the nearest hundredth of a second, when the ball hits the ground, that is, when $h(t) = 0$ ([Outcome](#)).

Show your work:

Answer: $t =$ _____ s

4. Solve the following system of linear-quadratic equations algebraically. Express your answers exactly, then approximate to the nearest hundredth ([Outcome](#)).

$$y = x^2 + x - 6$$

$$y = 2x - 2$$

Show your work:

Points of intersection: _____ and _____

5. Solve the quadratic inequality $x^2 - x - 12 \leq 0$. Show your factoring and state the solution using inequality notation ([Outcome](#)).

Show your work:

Solution: _____

6. Which point satisfies the inequality $y \leq x^2 - 4$ (Outcome)?

- A) (0, 0)
- B) (0, -5)
- C) (3, 1)
- D) (-1, -6)

Circle the correct letter and show your check below.

Answer key

1. $y = 3(x - 2)^2 + 5$: vertex (2, 5), axis $x = 2$, opens up. $y = -\frac{1}{2}(x + 4)^2 - 1$: vertex (-4, -1), axis $x = -4$, opens down. $y = x^2 + 7$: vertex (0, 7), axis $x = 0$, opens up.
2. a) $y = (x - 3)^2 - 4$; b) vertex (3, -4); c) $x = 1$, $x = 5$; d) y-intercept (0, 5); e) domain: all real numbers; f) range: $y \leq -4$.
3. Solving $-5t^2 + 20t + 1 = 0$ gives $t = (20 \pm \sqrt{420})/10$; taking the positive root, $t \approx 4.05$ s.
4. Setting $x^2 + x - 6 = 2x - 2$ gives $x^2 - x - 4 = 0$, so $x = (1 \pm \sqrt{17})/2$. Points: $((1 + \sqrt{17})/2, 2x - 2) \approx (2.56, 3.12)$ and $((1 - \sqrt{17})/2, 2x - 2) \approx (-1.56, -5.12)$.
5. Factoring gives $(x - 4)(x + 3) \leq 0$, so $x \leq -3$ or $x \geq 4$.
6. A) (0, 0): $0 \leq 0 - 4$ is true; B, C, and D each fail their check. Correct answer: A.