

Quadratic Functions

Name: _____

Date: _____

Concepts

- Finding the Rule of a Quadratic Function
 - Forms of the Equation of a Quadratic Function
 - Graphing a Quadratic Function
 - Solving Problems Involving Quadratic Functions
 - The Inverse of Quadratic Functions
 - The Properties of Quadratic Functions
 - The Quadratic Formula
 - The Quadratic Function (theory)
 - The Role of Parameters in a Quadratic Function (theory)
 - The Zeroes of a Quadratic Function
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Finding the Rule of a Quadratic Function

1. A parabola has vertex $V(3, -12)$ and passes through the point $(5, 0)$.
 - a) Find its rule in standard (vertex) form.
 - b) Rewrite the rule in factored form and in general form.
 - c) State the zeroes and the range of the function.

Forms of the Equation of a Quadratic Function

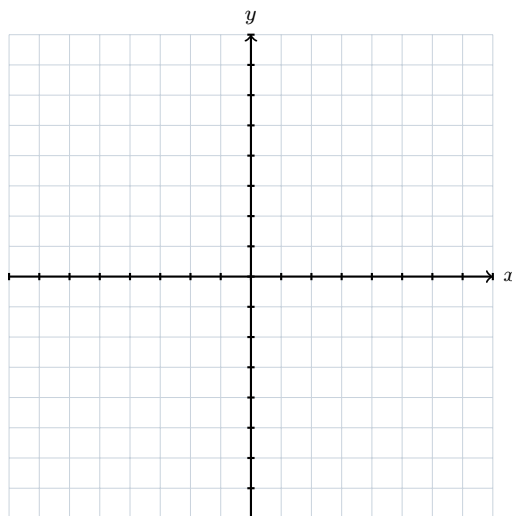
2. Consider $f(x) = 2x^2 - 12x + 10$.

- Write f in standard (vertex) form and state the vertex.
- Write f in factored form and state the zeroes.
- Which of the three forms lets you read off the y -intercept fastest, and what is it?

Graphing a Quadratic Function

3. Consider $f(x) = \frac{1}{2}(x - 2)^2 - 8$.

- State the vertex, the axis of symmetry, the zeroes and the y -intercept.
- Sketch the parabola on the grid below.
- Give the range of f and the interval over which f is decreasing.



Solving Problems Involving Quadratic Functions

4. The water jet of a fountain follows the curve $h(x) = -0.5x^2 + 4x$, where x is the horizontal distance from the nozzle and h the height, both in metres.

- a) Find the maximum height of the jet and where it is reached.
- b) For which horizontal distances is the jet at least 6 m high?

The Inverse of Quadratic Functions

5. The function $f(x) = 2(x - 3)^2 - 5$ is restricted to the domain $[3, +\infty[$. Find the rule of f^{-1} and state its domain.

The Properties of Quadratic Functions

6. Let $f(x) = -2x^2 + 12x - 10$. Give the coordinates of the vertex, the equation of the axis of symmetry, the zeroes, the extremum, the range, and the intervals over which f is increasing and decreasing.

The Quadratic Formula

7. Solve $2x^2 - 8x + 3 = 0$. Give the exact solutions, then a decimal approximation to the nearest hundredth.

The Quadratic Function

8. Four rules are given below. State which ones define a quadratic function, and justify your decision in each case.

a) $f(x) = (x - 3)^2 - (x + 1)^2$

b) $g(x) = 2x(x - 5) + 7$

c) $h(x) = \frac{x^2 + 1}{x}$

d) $k(x) = 3 - \frac{1}{2}x^2$

The Role of Parameters in a Quadratic Function

9. A quadratic function is written $f(x) = a(x - h)^2 + k$ with $a < 0$, $h > 0$ and $k < 0$. Without choosing any numerical values, determine the quadrant containing the vertex, the number of zeroes of f , and the range of f . Justify each answer using the parameters alone.

The Zeroes of a Quadratic Function

- 10.** Find the zeroes of $f(x) = -2(x - 3)^2 + 18$, and state the coordinates of the vertex.

Want the harder problems and the worked solutions?

The *Challenge Problems* set and the *Answer Keys* for Quadratic Functions — with the reasoning written out in full — are available at tutorinmontreal.ca.