

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

Finding the Rule of a Quadratic Function

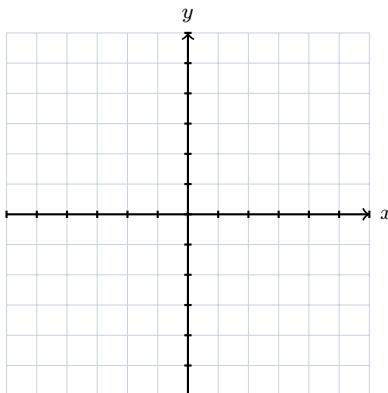
1. A quadratic function has its vertex at $(3, -8)$ and passes through the point $(5, 0)$. Write its rule in standard (vertex) form, then expand it into general form.

Forms of the Equation of a Quadratic Function

2. The function $f(x) = 2x^2 - 12x + 16$ is given in general form.
 - a) Rewrite it in standard (vertex) form and give the coordinates of the vertex.
 - b) Rewrite it in factored form and give the zeroes.

Graphing a Quadratic Function

3. Sketch $f(x) = -(x + 1)^2 + 4$ on the grid. State the vertex, the direction of opening, the zeroes and the y -intercept.



Solving Problems Involving Quadratic Functions

4. A diver leaves a platform and her height above the water, in metres, t seconds later is $h(t) = -5t^2 + 6t + 8$.

- What is the greatest height she reaches, and when?
- After how many seconds does she enter the water?

The Inverse of Quadratic Functions

5. Let $f(x) = (x - 3)^2 - 5$, with domain $\mathbb{R}$.
- a) Find the rule of the inverse relation f^{-1} .
 - b) Explain why this relation is not a function.
 - c) Restrict the domain of f so that the inverse *is* a function, and give the rule and the domain of that inverse.

The Properties of Quadratic Functions

6. Consider $f(x) = -2(x - 3)^2 + 8$.
- a) Give the coordinates of the vertex and state whether f has a maximum or a minimum.
 - b) State the domain and the range of f .
 - c) Over which interval is f increasing?
 - d) Find the zeroes and the y -intercept of f .

The Quadratic Formula

7. Solve $3x^2 - 7x - 6 = 0$ using the quadratic formula. Show the value of the discriminant.

The Quadratic Function

8. Only some of the rules below define quadratic (second-degree polynomial) functions. Identify them and justify each decision by simplifying the rule.

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

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

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

d) $k(x) = (x + 1)^2 - (x - 1)^2$

The Role of Parameters in a Quadratic Function

9. For a quadratic function written $f(x) = a(x - h)^2 + k$, state a rule that gives the *number of zeroes* using only the signs of a and k , and justify it algebraically. Then apply your rule to $f(x) = -3(x + 2)^2 - 5$ without computing any zero.

The Zeroes of a Quadratic Function

10. Find the zeroes of $f(x) = 2x^2 - 11x + 12$ by factoring.

Synthesis — drawing on several sheets in this topic

11. A cycling club rents a chalet and sells weekend passes. Market research shows that the number of passes sold is a first-degree function of the price: at \$60 a pass, 240 passes sell; at \$80 a pass, 200 passes sell. The revenue is the price multiplied by the number of passes sold.

- a) Find the rule $n(p)$ giving the number of passes sold at a price of p dollars.
- b) Express the revenue $R(p)$ and write it in standard form.
- c) Which price maximizes the revenue, and what is that maximum revenue?
- d) The club must raise at least \$14,400. For which prices is this achieved?

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.