

Unit 6: Quadratic Functions

Relations and Functions

Specific Outcome 1.

Demonstrate an understanding of the characteristics of quadratic functions, including:

- vertex
- intercepts
- domain and range
- axis of symmetry.

[CN, PS, T, V] [ICT: C6–4.1, C6–4.3]

1.1 Determine, with or without technology, the coordinates of the vertex of the graph of a quadratic function.

1.2 Determine the equation of the axis of symmetry of the graph of a quadratic function, given the x -intercepts of the graph.

1.3 Determine the coordinates of the vertex of the graph of a quadratic function, given the equation of the function and the axis of symmetry, and determine if the y -coordinate of the vertex is a maximum or a minimum.

1.4 Determine the domain and range of a quadratic function.

1.5 Sketch the graph of a quadratic function.

1.6 Solve a contextual problem that involves the characteristics of a quadratic function.

What do the Student know from Math 10-C?

In the Relations and Functions Outcomes for Math 10-C, students focus on Linear Relations. However many of the concepts learn will continue to grow as they go into Math 20-2 with Quadratic Functions.

Interpret and explain the relationships among data, graphs and situations. (Relations and Functions SO1)

Understand relations and functions (Relations and Functions S02)

Describe and represent linear relations using words, ordered pairs, table of values, graphs and equations. (Relations and Functions SO4)

Determine characteristics of linear graphs (Relations and Functions SO5)

Determining the equation of a linear functions using a variety of algebraic techniques. (Relations and Functions SO7)

Students will be able to relate an equation to their graphical representation. (Relations and Functions SO6)

Students will have an introduction to using function notation. (Relations and Functions SO8)

What do Student know from Math 20-1?

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Specific Outcome 3

Analyze quadratic functions of the form $y=a(x-p)^2+q$ and determine the:

• vertex • domain and range • direction of opening • axis of symmetry • x - and y -intercepts. [CN, R, T, V] [ICT: C6–4.3, C7–4.2]

3.1 Explain why a function given in the form $y = a (x - p)^2 + q$ is a quadratic function.

3.2 Compare the graphs of a set of functions of the form $y = ax^2$ to the graph of $y = x^2$, and generalize, using inductive reasoning, a rule about the effect of a .

3.3 Compare the graphs of a set of functions of the form $y = x^2 + q$ to the graph of $y = x^2$, and generalize, using inductive reasoning, a rule about the effect of q .

3.4 Compare the graphs of a set of functions of the form $y = (x - p)^2$ to the graph of $y = x^2$, and generalize, using inductive reasoning, a rule about the effect of p . Determine the coordinates of the vertex for a quadratic function of the form $y = a(x - p)^2 + q$, and verify with or without technology.

3.5 Generalize, using inductive reasoning, a rule for determining the coordinates of the vertex for quadratic functions of the form $y = a(x - p)^2 + q$.

3.6 Sketch the graph of $y = a (x - p)^2 + q$, using transformations, and identify the vertex, domain and range, direction of opening, axis of symmetry and x - and y -intercepts.

3.7 Explain, using examples, how the values of a and q may be used to determine whether a quadratic function has zero, one or two x -intercepts.

3.8 Write a quadratic function in the form $y = a(x - p)^2 + q$ for a given graph or a set of characteristics of a graph.

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Specific Outcome 4

Analyze quadratic functions of the form $y = ax^2 + bx + c$ to identify characteristics of the corresponding graph, including:

- vertex • domain and range • direction of opening
 - axis of symmetry • x - and y -intercepts and to solve problems. [CN, PS, R, T, V]
- [ICT: C6–4.1, C6–4.3]

- 4.1 Explain the reasoning for the process of completing the square as shown in a given example.
- 4.2 Write a quadratic function given in the form $y = ax^2 + bx + c$ as a quadratic function in the form $y = a(x - p)^2 + q$ by completing the square.
- 4.3 Identify, explain and correct errors in an example of completing the square.
- 4.4 Determine the characteristics of a quadratic function given in the form $y = ax^2 + bx + c$, and explain the strategy used.
- 4.5 Sketch the graph of a quadratic function given in the form $y = ax^2 + bx + c$.
- 4.6 Verify, with or without technology, that a quadratic function in the form $y = ax^2 + bx + c$ represents the same function as a given quadratic function in the form $y = a(x - p)^2 + q$.
- 4.7 Write a quadratic function that models a given situation, and explain any assumptions made.
- 4.8 Solve a problem, with or without technology, by analyzing a quadratic function.

What is Coming in Math 30-2

Relations and Functions SO 1 – 8

Students continue to explore graphs and equations of Sinusoidal, Rational, Polynomial (degree less than or equal to 3), Exponential and Logarithmic functions.