**Unit 3- Quadractics Functions and Equations\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Lesson 3.2 Quadratic Functions in Standard Form**

Specific Outcome **2.**  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.

The standard form of a quadratic function is\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

where *a, b* and *c* are real numbers and **a ≠ 0:**

**· \_\_\_** determines the width of the graph (large a means narrow, small a means wide)

· **\_\_\_\_** determine which direction the parabola opens (positive a opens up, negative a opens down)

· **\_\_\_** influences the position of the graph

· \_\_\_\_ is the y-intercept of the graph

**Example 1:Identify Characteristics of a Quadratic Function in Standard Form**

For each graph of a quadratic function, identify the following:

• the direction of opening

• the coordinates of the vertex

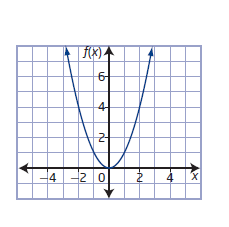
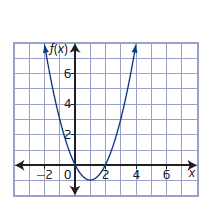
• the maximum or minimum value

• the equation of the axis of symmetry

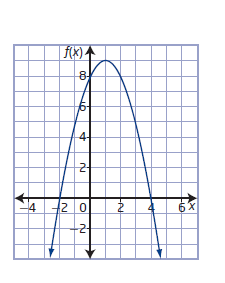
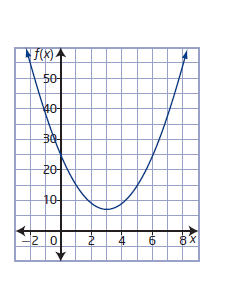
• the *x*-intercepts and *y*-intercept

• the domain and range

**a)** *f* (*x*) = *x*2 **b)** *f* (*x*) = *x*2 **–** 2*x*

* *

**c)** *f* (*x*) = **–***x*2 + 2*x* + 8 **d)** *f* (*x*) = 2*x*2 **–** 12*x* + 25

Example 1: Your Turn

For each quadratic function, identify the following:

• the direction of opening

• the coordinates of the vertex

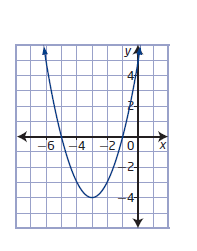
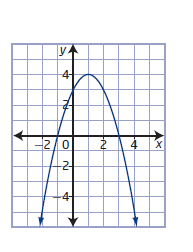
• the maximum or minimum value

• the equation of the axis of symmetry

• the *x*-intercepts and *y*-intercept

• the domain and range

**a)** *y* = *x*2 + 6*x* + 5 **b)** *y* = **–***x*2 + 2*x* + 3

**Example 2: Analysing a Quadratic Function**

A frog sitting on a rock jumps into a pond. The height, *h*, in centimetres, of the frog above the surface of the water as a function of time, *t*, in seconds, since it jumped can be modelled by the function *h*(*t*) = **–**490*t*2 + 150*t* + 25. Where appropriate, answer the following questions to the nearest tenth.

**a)** Graph the function using your calculator.

**b)** What is the *y-*intercept? What does it represent in this situation?

**c)** What maximum height does the frog reach? When does it reach that height?

**d)** When does the frog hit the surface of the water?

**e)** What are the domain and range in this situation?

**f)** How high is the frog 0.25 s after it jumps?

Example 2: Your Turn

A diver jumps from a 3-m springboard with an initial vertical velocity of 6.8 m/s. Her height, *h*, in metres, above the water *t* seconds after leaving the diving board can be modelled by the function *h*(*t*) = **–**4.9*t*2 + 6.8*t* + 3.

**a)** Graph the function using your calculator.

**b)** What does the *y*-intercept represent?

**c)** What maximum height does the diver reach? When does she reach that height?

**d)** How long does it take before the diver hits the water?

**e)** What domain and range are appropriate in this situation?

**f)** What is the height of the diver 0.6 s after leaving the board?

**Example 3:Write a Quadratic Function to Model a Situation**

A rancher has 100 m of fencing available to build a rectangular corral.

**a)** Write a quadratic function in standard form to represent the area of the corral.

**b)** What are the coordinates of the vertex? What does the vertex represent in this situation?



**c)** Sketch the graph for the function you determined in part a).

**d)** Determine the domain and range for this situation.

**e)** Identify any assumptions you made in modelling this situation mathematically.

Example 3: Your Turn

At a children’s music festival, the organizers are roping off a rectangular area

for stroller parking. There is 160 m of rope available to create the perimeter.

**a)** Write a quadratic function in standard form to represent the area for the stroller parking.

**b)** What are the coordinates of the vertex? What does the vertex represent in this situation?

**c)** Sketch the graph for the function you determined in part a).

**d)** Determine the domain and range for this situation.

**e)** Identify any assumptions you made.

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