A. Lesson Objectives

a. Review the key ideas from our Composition & Transformations lesson
b. Highlight the key features being communicated in the vertex form of a quadratic function
c. Graphically and algebraically analyze quadratic equations written in vertex form
d. Apply the vertex form of quadratic functions to mathematical models

B. REVIEW of Exploration in L24: Transformations

a. Compare the PARENT function $f(x) = x^2$ with the following functions: (GRAPH ON TI84)

$y = x^2$	$y = 2x^2$	$y = 3x^2$	$y = 4x^2$

b. Compare the PARENT function $f(x) = x^2$ with the following functions:

$y = x^2$	$y = \frac{1}{2} x^2$	$y = 1/3\ x^2$	$y = \frac{1}{4} x^2$

c. Compare the PARENT function $f(x) = x^2$ with the following functions:

$y = x^2$	$y = -x^2$

d. Compare the PARENT function $f(x) = x^2$ with the following functions:

$y = x^2$	$y = (x - 1)^2$	$y = (x - 2)^2$	$y = (x - 3)^2$

e. Compare the PARENT function $f(x) = x^2$ with the following functions:

$y = x^2$	$y = (x + 1)^2$	$y = (x + 2)^2$	$y = (x + 3)^2$

f. Compare the PARENT function $f(x) = x^2$ with the following functions:

$y = x^2$	$y = x^2 + 1$	$y = x^2 + 2$	$y = x^2 + 3$

g. Compare the PARENT function $f(x) = x^2$ with the following functions:

$y = x^2$	$y = x^2 - 1$	$y = x^2 - 2$	$y = x^2 - 3$

C. Transformations: Extend Your Thinking

Compare the PARENT function $f(x) = x^2$ with the following functions (NO GRAPHING ON TI84)

$y = (x - 5)^2 + 2$	$y = -(x + 2)^2 + 4$	$y = -\frac{1}{2}(x - 1)^2 - 3$	**$y = a(x - h)^2 + k$**

D. Analysis of Quadratic Functions in Vertex Form: Graphic & Algebraic

WITHOUT THE USE OF THE GRAPHING CALCULATOR, analyze the quadratic function **$y = \frac{1}{2}(x - 4)^2 - 2$**

(1) direction of opening:

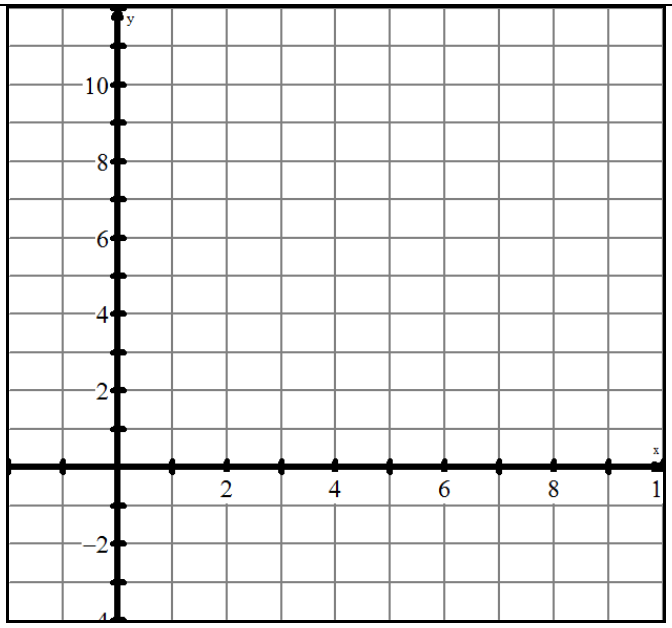
(2) vertex?

(3) max/min value?

(4) y-intercept?

(5) a non-intercept point?

(6) zeroes?



The Vertex Form of A Quadratic Function | Lesson 25

WITHOUT THE USE OF THE GRAPHING CALCULATOR, analyze the quadratic function $\mathbf{y = -2(x + 1)^2 + 10}$

(1) direction of opening:

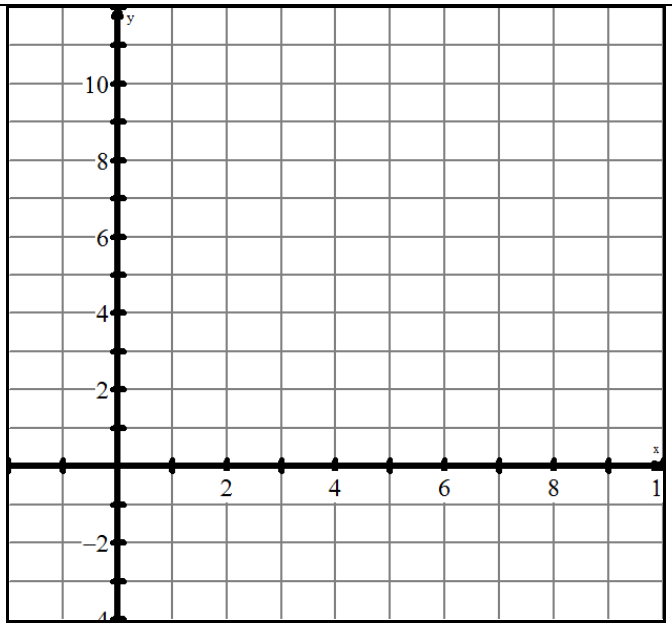
(2) vertex?

(3) max/min value?

(4) y-intercept?

(5) a non-intercept point?

(6) zeroes?



E. Applications of Quadratic Functions: Using Vertex Form

a. Example 1: A ball is hit into the air. Its height H (in meters above the ground) after t seconds is modelled by the function $H(t) = -5(t - 4)^2 + 120$. Answer the following questions WITHOUT THE USE OF THE TI84

i. In which direction does the parabola open/ how do you know?

ii. Determine the initial height of the ball. Show the analysis that leads to your answer.

iii. What are the co-ordinates of the vertex? What does the vertex represent in this situation?

iv. Determine one other co-ordinate on the curve and interpret its meaning.

v. When does the ball hit the ground? Show the analysis that leads to your answer.

vi. State the domain and range for this model. Explain the reasoning for your answers.

vii. Sketch the flight path of the ball

viii. CONFIRM your answers using the TI84

E. Applications of Quadratic Functions: Using Vertex Form

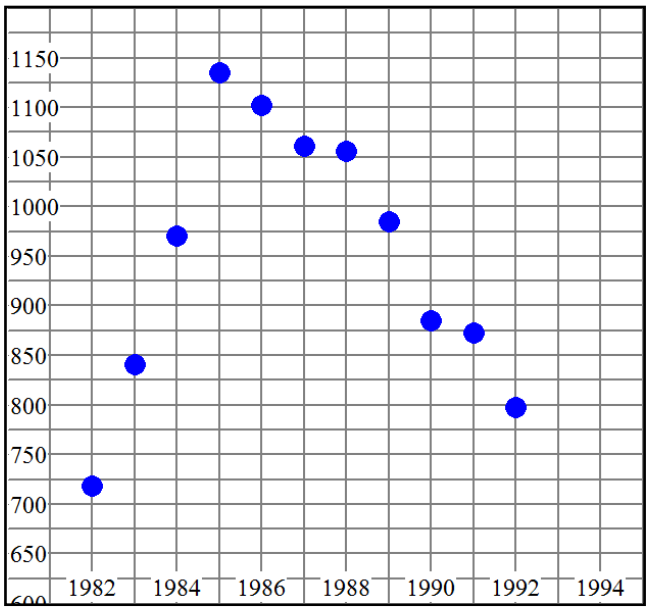
b. Example 2: The following table shows how many new cars were sold (in thousands) in Canada from 1982 until 1992:

Year	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Cars sold	718	841	971	1135	1102	1061	1056	985	885	873	798

i. Draw the curve of best fit

ii. Estimate the coordinates of the vertex.

iii. Determine an algebraic function that models this data



iv. Use the algebraic model to predict how many new cars were sold in 1994?

v. How would you describe the trend in car sales between the years 1982 – 1986?

vi. How would you describe the trend in car sales between the years 1986 – 1992? Give two reasons why.

vii. How well does the model work to predict the car sales in 2000 and beyond? Why?

viii. Check the accuracy of your model using your TI-84 and an appropriate regression.