A. Lesson Context

BIG PICTURE of this UNIT:	• How & why do we build NEW knowledge in Mathematics? • What NEW IDEAS & NEW CONCEPTS can we now explore with specific references to QUADRATIC FUNCTIONS? • How can we extend our knowledge of FUNCTIONS, given our BASIC understanding of Functions?		
CONTEXT of this LESSON:	Where we've been In Lesson 1, you were reviewed the graphs and algebra of quadratic functions as per IM2	Where we are HOW does the transformation of the parent function $y = x^2$, help us understand the "vertex form" of quadratic functions	Where we are heading How do we extend our knowledge & skills of quadratic functions, given the new ideas & concepts we now know about functions.

B. Lesson Objectives

a. Review KEY FEATURES of parabolas

b. Investigate the role of the parameters $\boldsymbol{a}$, $\boldsymbol{h}$ and $\boldsymbol{k}$ in the equation $y = \boldsymbol{a}(x - \boldsymbol{h})^2 + \boldsymbol{k}$ and relate that role to the concept of TRANSFORMATIONS

c. Apply the idea of transforming a parent function to (i) contextual applications & (ii) further functions

C. Fast Five (Skills Review Focus)

Given the quadratic function $f(x) = -\frac{1}{2}(x + 8)(x - 6)$:

(a) find the zeroes

(b) find the axis of symmetry

(c) find the vertex

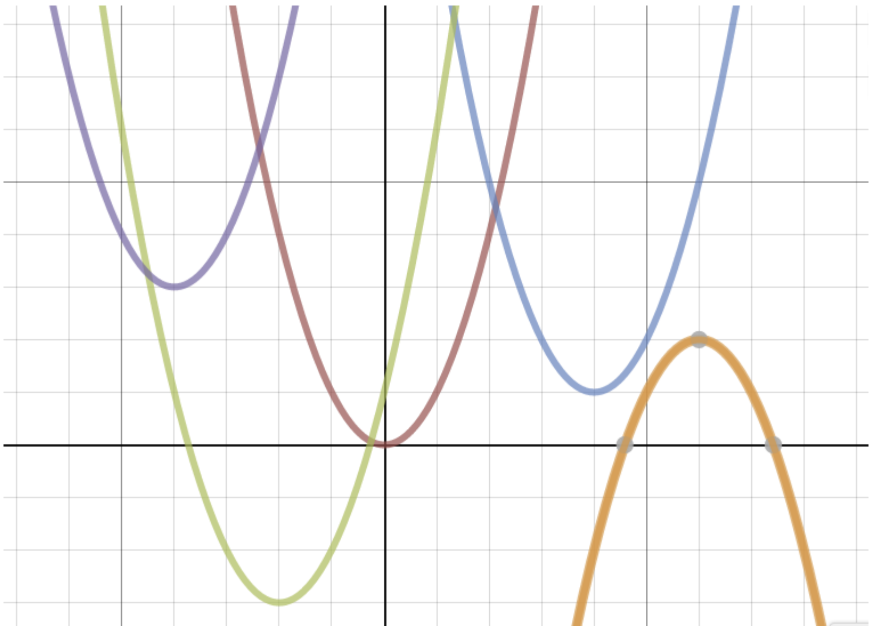
(d) find the y-intercept

(e) write the equation in standard form

(f) Sketch the parabola, labelling key features

D. Practicing with Transforming Quadratics

Example 1 (CI): You are given graphs of parabolas in the form of $y = (x - \boldsymbol{h})^2 + \boldsymbol{k}$. PREDICT the equations of each one & give a reason for your prediction. The parent function, $y = x^2$, is the red curve.



(a)

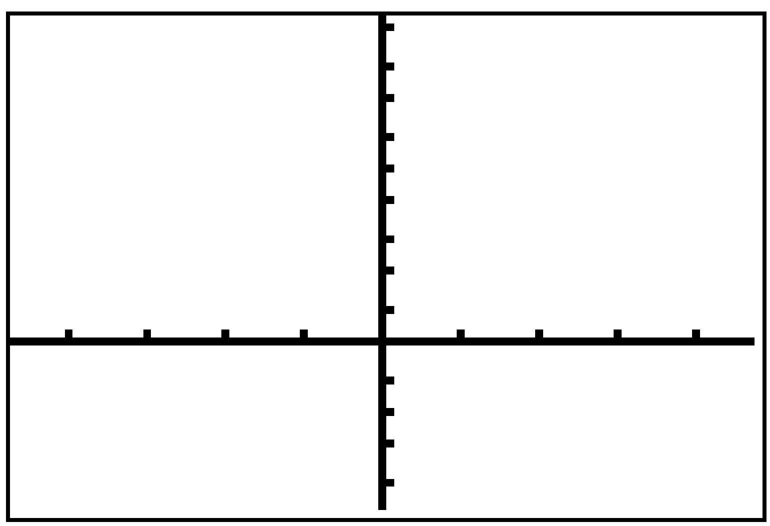
(b)

(c)

(d)

Example 2 (CI): Sketch the graph of $y = 2(x + 4)^2 - 3$ by transforming the graph of $y = x^2$. Sketch both graphs, label each graph.

Label the points (1,1) and (-1,1) on the parent function. Then label the corresponding, transformed points (i.e. where do these two original points wind up, AFTER the transformation?)

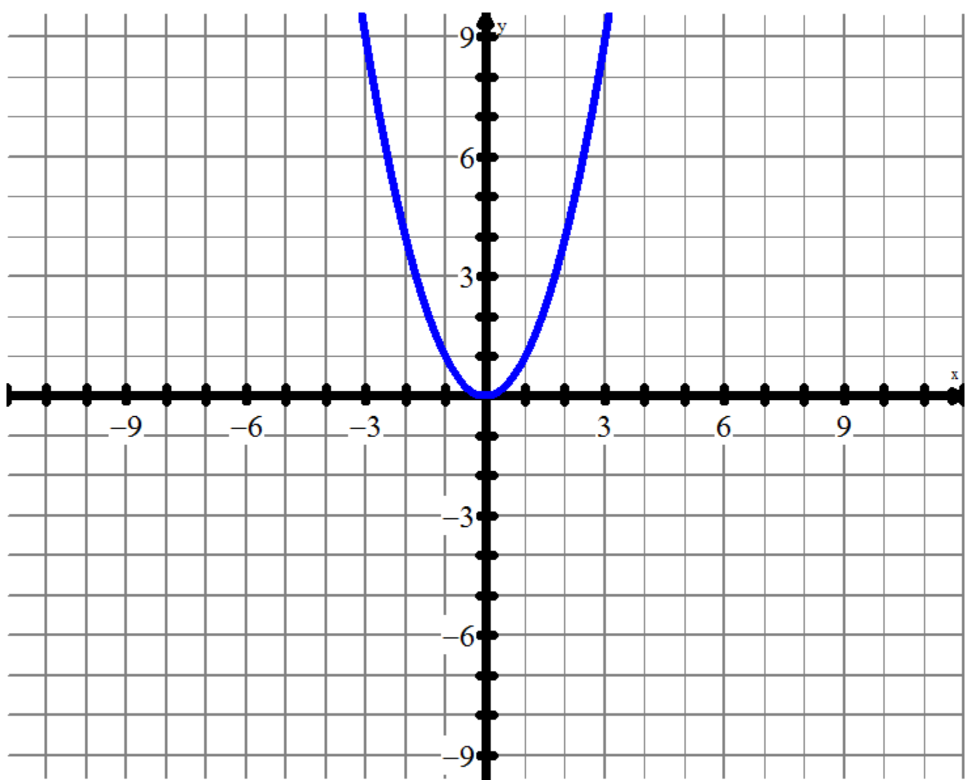


E. Example #1: Sketch the parabola $f(x) = 2(x-3)^2 - 8$ by HAND (NO TECH) by working through the following steps:

a. Start with the graph of the parent function, $y = x^2$. Label 3 points. State the location of the "optimal point" (i.e. vertex)

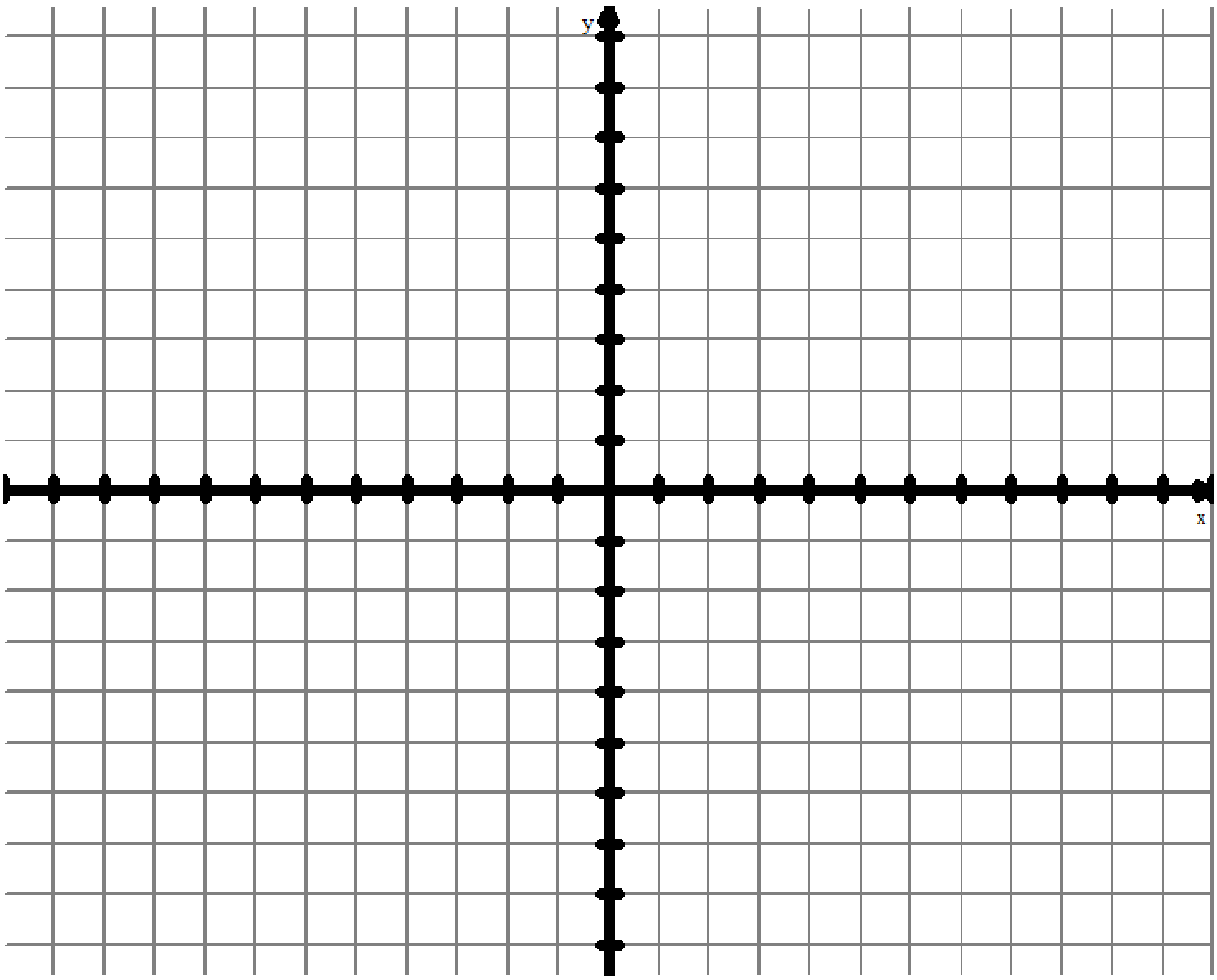
b. List the required transformations, given that the "new" equation is $f(x) = 2(x-3)^2 - 8$

c. Now apply the transformations to $y = x^2$ and graph the "new" parabola. Label three (3) points. State the location of the optimal point (vertex)



d. ANALYSIS QUESTION: How is the location of the vertex of the parabola "predictable", given the equation with which you started (i.e. $f(x) = 2(x-3)^2 - 8$)

F. Example #2: Sketch the parabola $g(x) = -3(x+5)^2 + 12$ and label the key points (vertex, y-intercept, x-intercept(s), axis of symmetry



G. Example #3:

A company's profit, in thousands of dollars, on sales of computers is modelled by the function $C(x) = -2(x - 3)^2 + 50$, where x is in thousands of computers sold.

a. Explain what $C(1) = 42$ means in the context of this problem.
b. What is the maximum profit that the company can reach when they sell computers.

To increase their profitability, the company sells anti-virus software. Their profit, in thousands of dollars, on sales of antivirus software is modelled by the function $S(x) = -2(x - 2)(x - 8)$, where x is in thousands of software packages sold.

c. Explain what $S(6) = 16$ means in the context of this problem.
d. What is the maximum profit that the company can reach when they sell software packages.

HL EXTENSION: As a promotional offer, the company now puts the computers and anti-virus software together as a "special package" and reduces the price of the total package by $75. Assuming that the profit models remain the same (i.e. C(x) and S(x)), determine the maximum profit that the company can earn.