IM2 Problem Set 6.8 - Working with Quadratic Functions

BIG PICTURE of this UNIT:	• How do we analyze and then work with a data set that shows both increase and decrease • What is a parabola and what key features do they have that makes them useful in modeling applications • How do I use graphs, data tables and algebra to analyze quadratic functions? • How can I use graphs and equations of quadratic relations to make predictions from data sets & their models

1. (CI) Factor the following, then use the factored form to solve the equations:

   a. $x^2 + 7x + 12 = 0$ b. $x^2 - 49 = 0$ c. $9x^2 - 49 = 0$ d. $x^2 - x - 72 = 0$

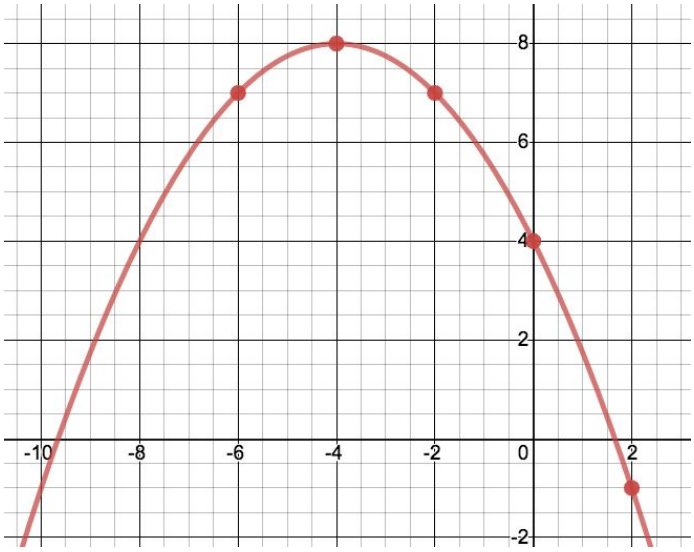
2. (CI) Factor the following, then use the factored form to solve the equations:

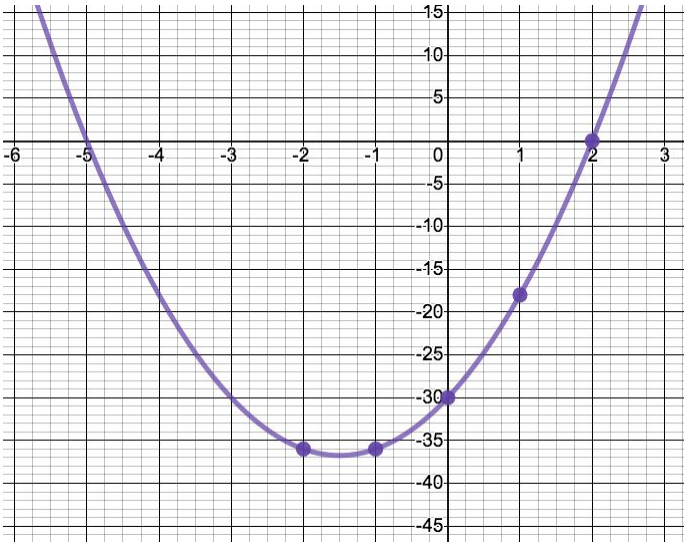
   a. $3x^2 + 11x + 6 = 0$ b. $4x^2 - 8x - 5 = 0$ c. $7x^2 + 19x - 6 = 0$

3. (CA) Given the following quadratic functions, graph the parabola on your calculator and then use your calculator to help you find "relevant information" so that you can rewrite each equation in factored form and also in vertex form.

   a. $f(x) = 6x^2 + 24x - 17$ b. $g(x) = 2x^2 + x - 6$

4. (CI) For the following parabolas, determine their equations and express your final answer for their equations using standard form.





5. (CI) For each quadratic relation given below:

   i. $y = 2x^2 - 9x + 4$ ii. $y = -2x^2 + 7x + 15$

   a. Express the equation in factored form.
   b. Determine the zeroes.
   c. Determine the coordinates of the vertex.
   d. Sketch the graph of the relation.

6. (CA) The average ticket price at a movie theatre from 1995 to 1999 can be modelled by the equation $C(t) = 0.06t^2 - 0.27t + 5.36$, where C is the price in dollars and t is number of years since 1995 (so then $t = 0$ represents 1995 and $t = 1$ represents 1996 ……)

   a. When where the ticket prices the lowest during this period?
   b. What was the average ticket price in 1998?
   c. What does the model predict the average ticket price will be in (i) 2010 and (ii) today?
   d. Write the equation in vertex form.
   e. Explain why you CANNOT write the equation in factored form.

7. (CI) A ball is hit from a height of 1 m. The height, h, of the ball in meters after t seconds can be modelled by $h(t) = -5t^2 + 9t + 1$. Find the maximum height of the ball.

8. (CA) A concert hall hires a live band every weekend. Their profits from these live performances is modelled by the function $P(x) = 50 + 600x - 15x^2$, where x represents the ticket price, in dollars.

   a. Find the axes of symmetry WITHOUT using the calculator and then find the vertex (use the calculator do help with your calculations, but do not graph yet)
   b. Now, set your windows and write down your window settings.
   c. Evaluate P(10) and explain what this point means.
   d. What do the x-intercepts represent?
   e. What is the maximum profit that the concert hall can get? What ticket price should be charged to obtain this profit?

EXTENSION PROBLEMS

9. Multiply and then simplify $(a + b)(a^2 - ab + b^2)$. Compare your final simplified answer to what you started with. Identify the pattern you see. Now use this pattern to factor the following expressions:

   a. (i) $x^3 + 8$ (ii) $x^3 + 27$ (iii) $8x^3 + 1$ (iv) $27x^3 + 8$
   b. How would you now factor $x^3 - 27$ and $8x^3 - 125$?