

IM2 Problem Set 6.5 - Working with Quadratic Functions

BIG PICTURE of this UNIT:	<ul style="list-style-type: none"> • 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. (CA) Expand the following factored quadratic expressions:

(i) $(2c + 1)(2c + 3)$

(ii) $(5x + 1)(2x + 5)$

(iii) $(3p + 2)(2p - 1)$

(iv) $(5g - 4)(2g + 1)$

(v) $(2y - 3)(9y - 1)$

(vi) $(5k - 4)(2k - 1)$

2. (CA) Factor the following quadratic expressions:

a. (i) $x^2 - 4x + 3$

(ii) $x^2 + 5x + 6$

(iii) $3x^2 - 9x + 6$

b. (i) $2x^2 + 3x + 1$

(ii) $3x^2 - 4x + 1$

(iii) $2x^2 - 7x + 6$

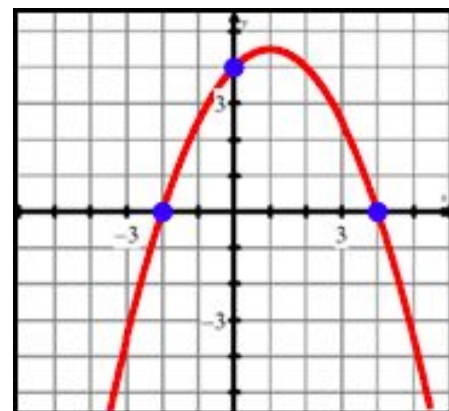
3. (CI) Given this parabola, write the equation of the parabola:

a. in factored form;

b. in vertex form;

c. in standard form.

d. Hence, or otherwise, state the domain and range.



4. (CI) Here are some number puzzles:

a. The sum of two numbers is 31, their difference is 41. Find these numbers.

b. The product of two numbers is 640. Their difference is 12. Find these numbers.

5. (CA) A rectangle is pictured. The length of the rectangle is 5 more than twice the width.

a. Explain why $L = 2W + 5$

b. Show that the function $A(W) = 2W^2 + 5W$ can be used model the area of the rectangle.

c. Graph the function and state the domain and range for this model.


d. Evaluate $A(12)$ and explain what this data point means in the context of the question.

e. Solve $A(W) = 900$ and explain what this data point means in the context of the question.



6. The data table below shows the numbers of FM radio stations in the US from 1997 to 2003.

- Use your calculator to create a scatter plot of the data. Use $t = 0$ be the year 1990.
- Use the regression feature of your calculator to find a **linear model** for the data and determine the value of the correlation coefficient, r .
- Plot this linear regression equation on the scatterplot.
- Use the regression feature of your calculator to find a **quadratic model** for the data and determine the value of the correlation coefficient, r .
- Plot this quadratic regression equation on the scatterplot.
- Which model is a better fit for the data? Explain why.
- Explain what each model would predict for the number of FM radio stations in years beyond 2003.
- Predict the number of radio stations in the US in 2013.
- In 2013, there were 6613 commercial FM radio stations in the US. Which model best predicted this total?
- Use each model to predict when the number of radio stations exceeds 7000. How confident are you about your predictions?



Year	FM stations, S
1997	5542
1998	5662
1999	5766
2000	5892
2001	6051
2002	6161
2003	6207

7. (CA) The function $B(x) = -x^2 + 12x + 155$ models the number of books, $B(x)$, sold in a bookstore x days after an award winning author appeared at an autograph-signing reception.

- Explain what $B(14) = 127$ means in the context of the problem.
- How many books were sold on the day that the author appeared at the autograph signing reception?
- What was the first day that at least 180 copies of the book were sold?
- State a reasonable domain and range for this model.

8. (CA) A rectangular field is to be fenced using 40 meters of fencing. Some numbers have already been provided for you to start this problem.

- Show different “fields” that could be constructed, given the fact that all 40 meters must be used. For each field, record the length, the width, and the area that results.
- Is there an equation you could write that models this application?
- Finally, what are the dimensions of the field that maximizes the area?

Length	5					
Width				17		
Area						84

EXTENSION PROBLEMS

9. A rectangular field is to be fenced on three sides with 1000 m of fencing. The fourth side is a straight river's edge that will not be fenced. Find the dimensions of the field so that the area of the enclosure is 120000 square meters.

10. A rectangular rink having dimensions 30 m by 50 m is to be expanded by adding rectangular strips of equal width to one length and one width. If the new rink will have an area of 1749 m², what will be the width of the strip?

(For solutions, go to:

https://npc.gvssd.ca/web/mdyck/NPC%20Website/PCM30S/Pre-Calc%2030S%20Material/Quadratic_Word_Problems_Examples.pdf