

1. Answer the following question, which deal with general properties of quadratics.

a. Solve the quadratic equation  $0 = (x + 2)^2 - 9$

**(K2)**

b. Fully factor the quadratic expression  
 $3x^2 + 15x + 18$

**(K2)**

c. Determine the equation of the axis of symmetry of  $f(x) = -3(x + 4)(x - 9)$

**(K2)**

d. State the range of the quadratic function

$$f(x) = -\frac{1}{2}(x - 4)^2 + 8$$

**(T2)**

e. Mr. S. knows that the quadratic function  
 $f(x) = 3(x + 5)^2 + 4$  has NO x-intercepts.  
EXPLAIN how he knows that this is true.

**(T1)**

f. Mr. S. knows that the quadratic function  
 $f(x) = \frac{1}{2}(x + 1)(2 - x)$  has a maximum  
value. EXPLAIN how he knows that this is true.

**(T1)**

2. Given the quadratic function  $g(x) = 3x^2 + 6x - 45$ . Answer the following questions wherein all work must be ALGEBRAICALLY supported in order to possibly earn full credit for each question.

a. Determine the y-intercept.

**(K1)**

b. Factor to find the zeroes of the parabola.

**(K2)**

c. Determine the co-ordinates of the vertex.

**(K2)**

d. Determine the co-ordinates of any other point on the parabola.

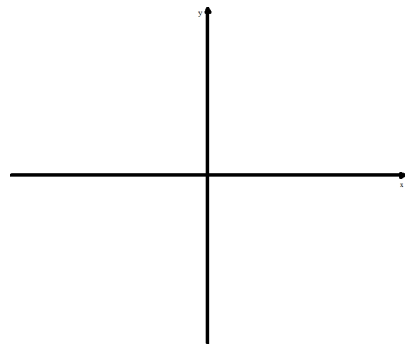
**(K2)**

e. Write the equation of this parabola in vertex form.

**(T2)**

f. Sketch the parabola on the grid provided, labeling the key features you determined in the previous questions.

**(C4)**



3. When Mr. Santowski hits a baseball, its height,  $h$ , in meters, after  $t$  seconds since being hit is modelled by  $h(t) = -5(t - 4)^2 + 81.3$  where  $h$  is the height of the ball, in meters,  $t$  seconds after the ball was hit. For this question, you are expected to present algebraic solutions in order to potentially earn full marks for your solutions.



- a. What is the height of the ball at the instant the ball is hit?

(A2)

- b. Find the maximum height of the ball and the time when this height is reached.

(A2)

- c. Determine the height of the ball at 7.5 seconds. Can Mr. S. catch the ball after its been in the air for 7.5s?

(A2)

- d. Determine the value(s) of the zeroes and interpret their meaning.

(A2,C1)

4. The quadratic function  $T(m) = 2m^2 - 10m - 28$  models the monthly temperatures of a scientific research station in Siberia, Russia, where  $T$  is the average daily temperature in  $^{\circ}\text{C}$  and  $m$  is the month of the year. In this model,  $m = 0$  represents the beginning of January and so  $m = 5.5$  would represent the middle of May.

- a. Use any suitable algebraic method to find the minimum value of  $T(m)$ .

**(A4, C1)**

- b. In order to VERIFY that your answer in Q(a) is correct, use ANOTHER algebraic method to find the minimum value.

**(T2, C1)**

- c. Use any suitable method in order to determine  $T(7.5)$  and then interpret the meaning of  $T(7.5)$ .

**(A2)**

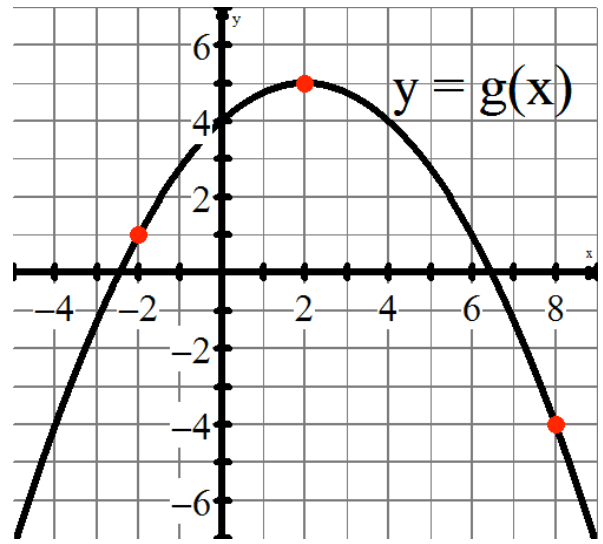
5. Answer the following about the given function of  $g(x)$  which is graphed on the grid below:

- a. State the maximum value.

**(K1)**

- b. State the maximum point.

**(K1)**



- c. Determine the equation of  $g(x)$  in vertex form.

**(A3)**

- d. Express the equation in standard form.

**(K2)**

- e. Algebraically, determine the values of the zeroes, correct to 2 decimal places.

**(K3)**

- f. Briefly explain how the parent function  $y = x^2$  was transformed so that its equation is now  $g(x)$ .

**(A2)**

6. A company prints and sells math textbooks. Their revenues are modelled by the quadratic equation  $R = -0.1b^2 + 16b - 100$ , where  $R$  is revenue in tens of thousands of dollars for the sale and printing of  $b$  thousands of textbooks. The expenses for printing and selling the  $b$  thousands of textbooks ( $E$ , in tens of thousands of dollars) are given by the linear equation  $E = 120 + 2b$ . This question can be modelled by the

system defined by 
$$\begin{cases} R(b) = -0.1b^2 + 16b - 100 \\ E(b) = 120 + 2b \end{cases}.$$

- a. EXPLAIN what it means to SOLVE A SYSTEM.

**(C1)**

- b. Now, solve the system using the method of your choice. Be sure to clearly communicate your solution, whether it be using algebraic or graphic representations.

**(K3,C1)**

- c. Interpret your answer in the context of the question.

**(A2)**

- d. How many books must the company sell if they wish to maximize their profits? Show the analysis that leads to your conclusion.

**(T2)**

TEST SCORES:

Application (A)	Communication (C)	Knowledge (K)	Thinking/PS (T)	Overall Score
<u>/21</u>	<u>/9</u>	<u>/23</u>	<u>/10</u>	

7. BONUS:  $2x + b = x^2 - 2x + 5$  → find the value of  $b$  such that the functions have at least one intersection point