7. [9 points] In an unexpected twist, Carson Soltonni also runs a business selling vacuum cleaners out of his house. The cost in hundreds of dollars for him to produce q hundred vacuum cleaners is

$$C(q) = \frac{q^3}{3} - 5q^2 + 59q + 5.$$

Carson sells his vacuum cleaners for 50 dollars each, and he is trying to determine how many to sell in order to maximize profit. Some values of $C(q)$, rounded to the nearest integer, are given in the table below.

q	1	2	3	4	5	6	7	8	9
$C(q)$	59	106	146	182	217	251	287	328	374

a. [1 point] What is the fixed cost of Carson's business?

Answer: _____ hundred dollars.

b. [3 points] Find the marginal revenue function $MR(q)$ and marginal cost function $MC(q)$ of Carson's business, in hundreds of dollars per hundred vacuum cleaners.

Answer: $MR(q) =$ _____ and $MC(q) =$ _____

c. [3 points] How many vacuum cleaners should Carson produce and sell to maximize profit? *Show your work and use calculus.* You do not need to fully justify your answer, but partial credit may be awarded for work shown.

Answer: _____ hundred vacuum cleaners.

d. [2 points] Unsure how to solve the calculus problem in part **c**., Carson just decides to produce and sell as many vacuum cleaners as he can. Unfortunately, a court order terminates Carson's business immediately after he had produced and sold 600 vacuum cleaners. At this point, had Carson's business *gained* or *lost* money? How much?

Give your answer by circling GAINED *or* LOST *and writing a* positive *number on the blank.*

Answer: Carson's business GAINED LOST _____ hundred dollars.