

Decision Report 3

MATH 144 Applied Calculus for Business
Sales Revenue and Marginal Revenue

Team: _____
Score:

In your previous decision report, your team determined a quadratic function $p = D(q)$ which best fits the demand relationship between quantity of items sold q (in thousands) and sale price p (in dollars per unit) on the national market for your product. This function looked something like the example below:

$$p = D(q) = -0.0000535q^2 - 0.034403q + 414.535.$$

This relationship between price and quantity permits your team to also determine the **sales revenue** — the total amount of income your company would take in from sales — at each quantity. This is also a function $R(q)$, defined as the amount of money earned by selling q thousand units at a price of p dollars per unit. In other words, revenue is quantity multiplied by price, but price is given by your demand function: in this example,

$$R(q) = qp = q(-0.0000535q^2 - 0.034403q + 414.535)$$

(Because q is measured in thousands of units, $R(q)$ is measured in thousands of dollars.)

Meanwhile, the **marginal revenue** at a given quantity refers to the additional amount of revenue that would be earned by producing one additional unit of your product. More precisely, marginal revenue is the (instantaneous) rate of change of revenue with respect to a change in quantity, which is the derivative:

$$MR(q) \quad \text{or} \quad R'(q) = -0.0001605q^2 - 0.068806q + 414.535.$$

Marginal revenue, being a slope on the graph of q in thousands of units vs. R in thousands of dollars, has units of dollars per unit. Because it is its derivative, MR can tell you whether and how much an increase in quantity will increase revenue (if MR is positive), or decrease revenue (if MR is negative).

Now that you've done some analysis, the project lead who was responsible for the test marketing data wants a status report. What does each of the test markets predict about total revenue on the national market?

Decision: Which one of the test market price points predicts the highest amount of national sales revenue? Between which two prices is the actual maximum possible revenue likely to be found? Explain your findings in a memo to the test marketing project lead, complete with a table of data.

Deliverable: Your team should determine formulas for revenue $R(q)$ and marginal revenue $MR(q)$ as a function of quantity in the national market (in thousands), as well as a table of values showing q , p , R , and MR at at least four different price points from your test markets.
