Math 165: Maximizing Revenue

To view animations:

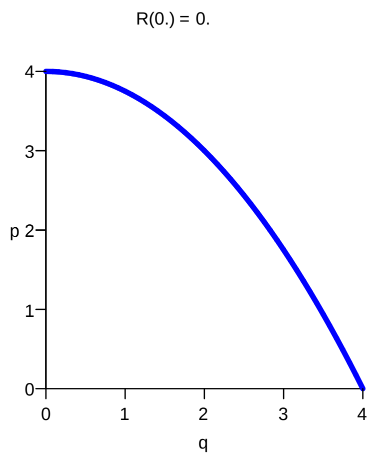
`http://www2.math.uic.edu/~lewis/math165/165maxrev.htm`.

Suppose the quantity (demand) q and the price p are related, e.g., by a relation of the form $p = D(q)$.

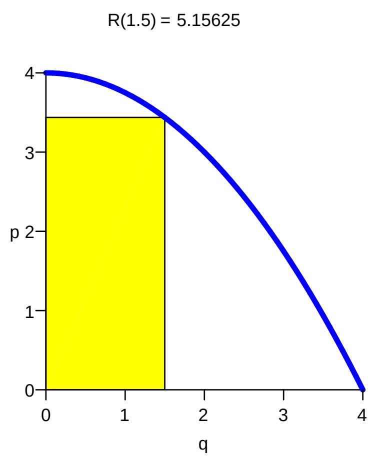
The problem is find the quantity q so that the revenue, $R = pq$, is maximized. The revenue R can be expressed as a function of the quantity q by

$$R(q) = q * D(q).$$

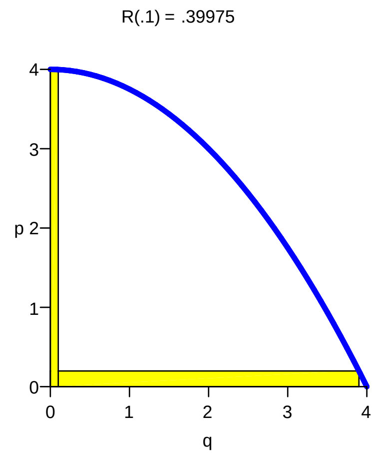
A typical demand function looks like this:



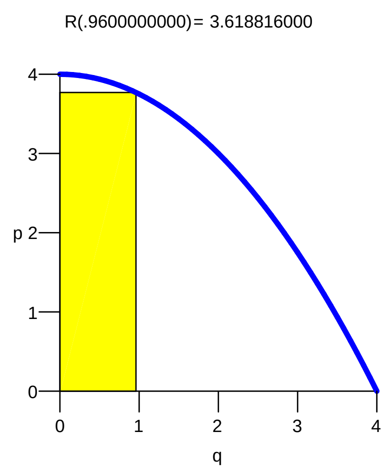
Notice that the revenue, $R(q) = p \cdot q = q \cdot D(q)$, is represented by the it area of the rectangle with opposite vertices at $(0, 0)$ and $(q, D(q))$.



Notice that when q is very small or near the right side, the area of the rectangle is small.



Now observe how the area (revenue) changes as q moves from 0 to 4.



It appears that for q small (high price and low demand) the revenue is small. For p small (low price, market is saturated), there is low revenue. For some reasonable price p, the revenue (area) is maximized.

The mathematical assumptions are:

- Increasing p means decreasing demand.
- There is maximum price $D(0)$ the consumer will pay.
- There is maximum consumer demand (In our example, $q = 4$).