Department of Mathematical Sciences   Fall 2001
Carnegie Mellon University

21-121 Calculus 1 (IM/Econ)

Assignment 4

Test 1 will be given during lecture on Friday, September 28, 2001.

Solutions to *all* the following problems should be written up and
hand in to your TA.

Due in recitation on Thursday, September 27, 2001

Section 3.2: Problems 11, 14, 16, 20, 26, 32, 38
Section 3.3: Problems 27

Supplementary Problems*:

1. For a certain manufacturer, the revenue r obtained from the sale of q units
   of a product is given by

   $$r = 20q - .1q^2.$$

   (a) What is the marginal revenue when $q = 100$?

   (b) Using the marginal revenue at $q = 100$, estimate the total revenue
       received when $q = 99$.

   (c) What is the exact amount of revenue received when $q = 99$?

2. Suppose that the savings function for a country is

   $$S = \frac{I - \sqrt{I} - 6}{\sqrt{I} + 2},$$

   where national income I and national savings S are measured in billions
   of dollars. Find the countries marginal propensity to consume and its
   marginal propensity to save when the national income is $16 billion.

Supplementary Information*:

A manufacturer's **cost function** $c = f(q)$ gives the total cost of producing and marketing q units of a product. The rate of change of c with respect to q is called the **marginal cost**. Thus

$$\text{marginal cost} = \frac{dc}{dq}.$$

The marginal cost provides an estimate for the increase (or decrease) in cost of increasing (or decreasing) production by one unit.

Similarly, a manufacturer's **revenue function** $r = f(q)$ gives the total revenue received for selling q units of a product. The rate of change of r with respect to q is called the **marginal revenue**. So

$$\text{marginal revenue} = \frac{dr}{dq}.$$

The marginal revenue provides an estimate for the increase (or decrease) in revenue received from selling one more (or less) unit.

The **consumption function** $C = f(I)$ expresses the relationship between the total national income I and the total national consumption C. The **savings function** $S = g(I)$ gives the total national savings in terms of I. Since whatever income not used to consume is by definition saved, we must have

$$S = I - C.$$

The rate of change of C with respect to I is called the **marginal propensity to consume**, while the rate of change of S with respect to I is called the **marginal propensity to save**. In other words

$$\text{marginal propensity to consume} = \frac{dC}{dI},$$

and

$$\text{marginal propensity to save} = \frac{dS}{dI}.$$