Homework #1C

1. Find the derivative of each of the following functions:

   a. $g(x) = 7x^6$

   b. $k(y) = 3y^{-1}$

   c. $m(q) = \frac{3}{2}q^{-2/3}$

   d. $h(w) = -aw^2 + bw + \frac{c}{w}$

   e. $u(z) = 5$

2. The Total Product of a firm, denoted by TP, depends on the amount of capital and labor that it employs. Denote capital by K and denote labor by L.

   The Total Product function is given by: $TP(K,L) = K^{0.5} \cdot L^{0.5}$.

   Throughout this problem, assume that the firm's capital stock is fixed at one unit.

   a. Plot the Total Product function from zero units of Labor to four units of Labor. (Hint: Use graph paper if you have it).

   b. Now find the Marginal Product of Labor by taking the derivative of the Total Product function with respect to Labor.

   c. Plot the Marginal Product of Labor from zero units of Labor to four units of Labor.

3. The Total Cost function of a firm depends on the quantity of output that it produces, denoted by Q.

   The Total Cost function is given by: $TC(Q) = Q^3 - 6Q^2 + 18Q + 6$.

   a. Plot the Total Cost function from zero units of output to five units of output. (Hint: Use graph paper if you have it).

   b. Does the Total Cost function ever slope downward? Or is it strictly increasing?

   c. Now find the Marginal Cost function by taking the derivative of the Total Cost function with respect to the quantity of output that the firm produces.

   d. Plot the Marginal Cost function from zero units of output to five units.

   e. Does the Marginal Cost function ever slope downward? Or is it strictly increasing?

   f. If the Total Cost function never slopes downward, then why does the Marginal Cost function slope downward over some ranges of output?