

Place your name on the back of this sheet of paper and nowhere else. Staple your answers face up on the front of this sheet of paper. Failure to follow these directions will cost you 10 points. If you use double-sided printing or print on the back of scrap paper, I will give you one additional point.

Show all work on all questions.

1) (20 points) Suppose the tax function was given by the function to the right. Plot the function and the marginal tax rate. State how you determined the marginal tax rate. Is it differentiable? Explain your logic.

$$T(I) = \begin{cases} I \leq \$20K & .1I \\ \$20K < I \leq \$40K & 2K + .2 * (I - 20K) \\ \$40K < I \leq \$80K & 6K + .3 * (I - 40K) \\ I > \$80K & 18K + .4 * (I - 80K) \end{cases}$$

2) (5 points) Is the function $F(X) = \lfloor 2X \rfloor$ differentiable? Explain your logic.

3) (5 points) If the demand for a perfectly competitive firm is given by $P=8$. Find the total revenue and marginal revenue functions.

4) (15 points) In microeconomics, we said that the MR curve for a straight line demand curve starts at the same place as the demand curve but is twice as steep. We will now prove it. If the inverse demand function is given by $Q = a - bP$, find the functions for total revenue and marginal revenue. Prove that the marginal revenue and demand curves start at the same point but the MR is twice as steep.

5) (20 points) The book draw the function $TP(L) = L^{3/2}$. But that is unrealistic for large number of workers. So, I want you to plot $TP(L) = L^{1/2}$ and the $MP(L)$ function.

6) (5 points each) Find each of the following.

A) If $TP(L) = 4L - L^{1/2}$ then find $MP(L)$

B) If $U(H) = 8H^{1/4} + H^{1/2}$ then find $MU(H)$

7) (25 points) The marginal revenue product of labor is found by calculating total revenue as a function of labor and then taking the derivative of that with respect to L . Suppose that the demand curve is given by $P = 10 - Q^{1/4}$ and output is given by $Q = TP(L) = 16L^{1/2}$. Find the total revenue function as a function of L and use that to find the $MRP(L)$. Another way to calculate the $MRP(L)$ is to calculate $MR(Q)$ and multiply it by $MP(L)$. Do both of those calculations, convert $MR(Q)$ to a function of L and then multiply them. Verify you get the same result.