

Place your name on the back of this sheet of paper and nowhere else. Staple your answers 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 write on the back of scrap paper, I will give you one additional point.

1) (15 points each) For each of the following functions, plot it. Also, determine if it is differentiable. If it is not, then explain why it is not.

$$\begin{aligned} \text{A) Total taxes paid} &= \begin{cases} .1 * I & I \leq 5000 \\ 500 + .2(I - 5000) & 5000 < I \leq 25,000 \\ 4500 + .3(I - 25,000) & 25,000 < I \leq 55,000 \\ 13,500 + .4(I - 55,000) & I > 55,000 \end{cases} \\ \text{B) Marginal tax rate} &= \begin{cases} 10\% & I \leq 5000 \\ 20\% & 5000 < I \leq 25,000 \\ 30\% & 25,000 < I \leq 55,000 \\ 40\% & I > 55,000 \end{cases} \end{aligned}$$

2) (10 points each) Find the following functions.

A) Find $MP(L)$ if $TP(L) = 4L^{1/2}$. (Note the graphs on Page 151 are wrong. They plotted the functions correctly, but their $TP(L)$ function is not a valid $TP(L)$ function.)

B) Find the MR for a monopoly when TR is given by $P(Q) * Q$ and the inverse demand function is given by $P(Q) = 100 - 4Q$. Use the product rule rather than multiplying out then taking the derivative.

C) Redo Part B by doing the multiplication before you take the derivative.

D) $ATC(Q)$ where $TC(Q) = Q^2 + 5Q + 100$. Use the quotient rule.

E) Redo Part D by dividing before you take the derivative.

3) (10 points) Explain why the marginal cost curve must go through the minimum of the average total cost function.