

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. Your assignment will be typed, except graphs can be drawn by hand and mathematical equations can be done by hand. Failure to type it 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.

- 1) (30 points) Draw the TPL curve and on a graph below that, draw the APL/MPL graph. Explain why the TPL curve takes its shape. Explain how the two maxima of the APL and MPL are seen on the TPL graph and draw the lines down connecting the graphs.
- 2) (30 points) Suppose the production function is given by the equation $Q = KL$. If the price of capital is $\$2/K$ and the price of labor is $\$4/L$, then setup the Lagrangian which can be used to find the total cost function. State how you got the Lagrangian. Do the necessary calculations to find the $TC(Q)$, $ATC(Q)$, and $MC(Q)$ functions. Show all work.
- 3) (10 points) Draw the isoquants for perfect substitutes. Explain why they take that shape.
- 4) (10 points) What is the equation for the slope of an isoquant? Explain why that makes sense.
- 5) (20 points) Draw an isoquant/isocost line diagram for a firm facing increasing returns to scale. Explain how you know your graph shows increasing returns to scale. What is the economic reason a firm might have increasing returns to scale?