

EC-308: Homework 2

Due in class on Monday, October 24

For full credit, please provide as detailed work as you can on the following problems. You can work in groups of 2 but must submit your own work. You should answer using graphs wherever possible.

Q1. Recall that leisure time in our model of the representative consumer is intended to capture any time spent not working in the market, including production at home such as yard work and caring for children. Suppose that the government were to provide free day care for children and, for the purpose of analyzing the effects of this, assume that this has no effect on the market real wage w , taxes T , and dividend income π . Determine the effects of the day care program on consumption, leisure, and hours worked for the consumer. Draw graphs to illustrate your answer. [Note: The primary objective of this question is to force you to think what happens when consumer's preferences over c and l change. Remember that leisure represents all time used for non-market activities.]

Q2. In the course of producing its output, a firm causes pollution. The government passes a law that requires the firm to stop polluting, and the firm discovers that it can prevent the pollution by hiring 0.1 workers for every worker that is producing output. That is, if the firm hires N workers, then $0.1N$ workers are required to clean up the pollution caused by the N workers who are actually producing output. Determine the effect of the pollution regulation on the firm's profit-maximizing choice of labor input, and on the firm's labor demand curve. Show in graphs and explain.

Q3. Suppose that the government subsidizes employment. That is, the government pays the firms t units of consumption goods for each unit of labor that the firm hires. Determine the effect of the subsidy on the firm's demand for labor. Show in graph and explain.

Q4. Suppose a firm called New England Patriots Inc. has a production function given by

$$Y = zK^{0.3}N^{0.7}.$$

1. If $z = 1$ and $K = 1$, graph the production function. Is the marginal product of labor positive and diminishing? For graphing, you can consider values of $N = 5, 10, 15, 20, \dots$
2. Now, graph the production function when $z = 2$ and $K = 1$. Explain how the production function changed from part 1.
3. Next, graph the production function when $z = 1$ and $K = 2$. What happens now?
4. Given the production function, graphs the MP_N for $(z, K) = (1, 1), (2, 1), (1, 2)$. Explain what you see.

Note: here, you must compute MP_N based on the production function given above. In order to do that you must compute $\frac{\partial}{\partial N}(zK^{0.3}N^{0.7})$. Note that ∂ means "partial" derivative. Here, you compute derivative of $zK^{0.3}N^{0.7}$ with respect to N , considering K a constant, like a number. One way to do that is to assume that $zK^{0.3} = b$, a constant. So we take our "regular" derivative $\frac{dbN^{0.7}}{dN} = \frac{b dN^{0.7}}{dN}$. Once this derivative is computed, we substitute the value of b in our answer and that's the *partial* derivative we want.