

ECO 601  
Fall 2003  
Problem Set #8

Due: Friday, November 7.

1. Nicholson 12.6
2. The production function for small plastic gears that go into computer printers is given by  $Q = (K^{1/2} + L^{1/2})^2$ , where  $Q$  denotes units of output,  $L$  denotes person-hours, and  $K$  denotes machine hours.
  - a) Write expressions for the marginal products of labor and for capital.
  - b) Suppose  $w$ , the wage rate, is \$10 per person-hour and  $v$ , the rental rate on machines, is \$1 per machine hour. Find the cost-minimizing combination of labor and capital for a manufacturer who wants to produce 12,100 plastic gears.
3. Nicholson 12.8
4. Suppose that after completing your graduate studies you decide to go back to work in the family business, which involves making plastic parts for laptop computers. After a couple of weeks on the job, you realize that in the real world, it is impossible to make plastic parts using just capital and labor. Raw materials are also a necessary ingredient. The production process in your factory is given by the following function:  $Q = K^{.5}L^{.25}M^{.25}$ , where  $K$  and  $L$  represent capital and labor inputs, and  $M$  represents the raw material input.
  - a) The per unit prices of  $K$ ,  $L$ , and  $M$  are represented by  $v$ ,  $w$ , and  $u$ . Solve for the firm's total cost function  $TC = C(Q, v, w, u)$ .
  - b) Given that  $v=2$ ,  $w=16$ , and  $u=1$ . Graph the firm's total, average, and marginal cost curves.
  - c) Suppose that capital were fixed in the short run at  $K = 10$ . Graph the firm's SRAC curve in the same diagram as the LRAC curve in (b). Do the same thing for  $K = 20$  and  $K = 40$ .
5. After Burton Denson graduated with honors from the American Trucking Academy, his proud (and rich) parents gave him a new \$350,000 tractor-trailer rig. At a recent class reunion of ATA alums, Burton boasted to some fellow truckers that his revenues were typically \$25,000 per month, while his operating costs (fuel and maintenance) amounted to only \$18,000 per month. The other truck drivers are all employees of various trucking companies, and bemoaned the fact that they are only averaging \$5,000 per month in salary and benefits, while Burton is taking home \$7,000. They wish that they had rich parents so that they could be in business driving their own rigs like Burton. Since you are attending the class reunion with your spouse, who is also an alum of the ATA, you overhear this conversation. Your spouse turns to you and says, "OK Mr./Ms. graduate student, I'm driving trucks across the country to put you through school, what do you think of this guy's reasoning? Why don't we take the \$350,000 we have in mutual funds and cash it in, and buy me a rig of my own. Then I can quit driving for J. B. Hunt Trucking Co. and work for myself like Burton." How do you answer your spouse? (Hint: this questions calls for an evaluation of the economic profitability of being an independent trucker.)