

**Test 1**  
**Economics 136 – Human Resources**  
**Fall 2003**  
**Prof. Julian Betts**

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Name: \_\_\_\_\_

Student ID \_\_\_\_\_

There are 4 written problems in this exam, worth a total of 40 points. Please write neatly. If you place the answer to a question in an odd place, such as the back of the page, please indicate this clearly, for the sake of the graders.

If you use pencil, the exam cannot be regraded. If you do submit your test for regrading, you must do within the time and other guidelines listed in the syllabus.

**SHOW ALL YOUR WORK!**

You have 80 minutes. Good luck.

For the graders:

1.	_____	/15
2.	_____	/12
3.	_____	/10
4.	_____	/3
SUM	_____	/40

1. (15 points) Suppose that a firm has a production function given by  $Q=L^{0.4}H^{0.6}$  where  $Q$  is output per hour and  $L$  and  $H$  are the numbers of workers who are low-skilled and high-skilled respectively.

a) Given this production function, at the firm in question do workers work independently of each other or in an interdependent fashion? Explain in a sentence. (2 points)

b) Calculate the marginal product of workers of either type, e.g.  $\partial Q/\partial L$  and  $\partial Q/\partial H$ . Then calculate the ratio of these marginal products per worker. (3 points)

c) Suppose that there is no capital cost in this business, so that the total cost of hiring one worker with low or high skills is given by the corresponding wage rates  $W_L$  and  $W_H$ . Write down the Lagrangean and take the first-order conditions. Then use the first order conditions to calculate an equation for the cost-minimizing ratio of workers of each type, that is,  $L/H$ . Verify that the cost to output ratios are identical for the two types of labor. (7 points)

d) Draw a graph that shows the shape of a typical isoquant and isocost line, and illustrate the optimal combination of L and H for the given production level. You do not need to derive the general equation for the isoquant. Instead just show the general shape. For the isocost, do state the formula for the slope. (3)

2) Suppose that your profit-maximizing firm wants to hire only skilled workers, but it cannot detect a worker's skills until after the first period of employment. Workers can work for you at most **THREE** periods before retiring. In the general labor market, skilled and unskilled workers earn  $W_S > W_U$  respectively per period. Workers maximize the sum of wages over the three periods of their working lives.

Suppose that the firm designs a probation program under which new hires earn a wage  $W_1$  in period 1, and if they are not fired at the end of period 1 they earn  $W_P$  in both periods 2 and 3. Derive values of these two wages that will ensure that the skilled will want to work for your company while unskilled workers will strictly prefer not to work for your firm. Assume that the wages per period must be in increments of \$0.25. Show your work. (12 points)

3) (10 points) Suppose that the labor force in your region consists of one-third each of workers with productivity of \$3, \$6, and \$8 per hour. The Telemarketing Industry has two types of firms, those that offer a fixed salary per hour and those that pay a piece rate. These firms operate in a competitive market, so their profits will be zero, indicating a normal rate of return on their capital.

Because it is costly to monitor output, the piece-rate firms deduct \$2 per hour for the costs of monitoring. (This monitoring is expensive because the company has to hire lots of sleazy managers who randomly listen in on their workers' phone calls, to make sure that they are making calls quickly enough.) Fixed-salary firms do not monitor workers.

a) Derive a fixed salary per hour with which the fixed-salary firms could attract labor and make profits of zero. These firms want to hire as much labor as possible subject to the zero-profit constraint. Explain which type(s) of workers work for the piece-rate and fixed-salary firms. (4 points)

b) Ignoring monitoring costs, at which firms are workers more productive on average? Explain. (2 points)

c) Suppose that computerization now makes it possible to monitor workers' phone call rates for only \$1 per hour. Now the piece rate firms have to deduct only \$1 per hour from workers' output. What should the fixed-salary firms pay per hour now? Indicate which types of workers opt to work for piece-rate firms and for fixed-salary firms now. Does this technical change alter the piece-rate firms' share of the market? How? (4 points)

4. Suppose that at University X all senior professors are currently paid \$60,000 per year thanks to a collective bargaining agreement. In reality, half of these professors could earn \$60,000 at their next best job alternative and for the other half their next best alternative is flipping burgers at MacDonalds for \$20,000 per year.

Due to a state budget crisis, the university plans to offer early retirement to all senior professors, which boosts their retirement income by \$10,000 per year beyond what it would otherwise be. In return, senior professors would retire and would not receive any further university salary.

a) Which professors will accept this offer? Why? Will the average quality of professors rise, fall, or stay the same? (2)

b) This phenomenon is an example of \_\_\_\_\_ selection (Fill in the blank) (1)