

## FINAL EXAMINATION VERSION B

INSTRUCTIONS: This exam is closed-book, closed-notes. Simple calculators are permitted, but graphing calculators, calculators with alphabetical keyboards, computers, wireless devices and mobile phones are NOT permitted. Point values for each question are noted in brackets. Maximum total points are 100.

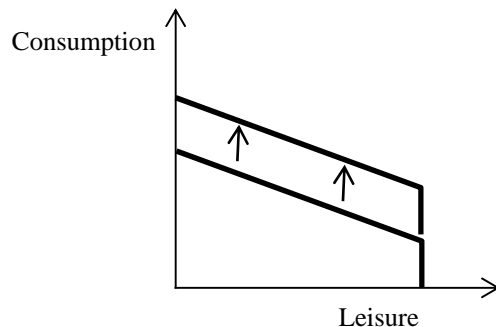
**I. Multiple choice:** Please circle the one best answer to each question. [2 pts each, 44 pts total]

(1) A person who is not currently working, but last looked for a job six weeks ago, would be classified in the U.S. as

- a. employed.
- b. unemployed.
- c. out of the labor force.

(2) In the graph below, the budget constraint is changing because of

- a. an increase in the wage.
- b. a decrease in the wage.
- c. an increase in nonlabor income.
- d. a decrease in nonlabor income.
- e. a change in preferences.



(3) If only one firm enjoys a wage decrease, it will increase its employment of labor \_\_\_\_\_ it would if all firms in the same industry enjoyed a wage decrease.

- a. just as much as.
- b. more than.
- c. less than.

(4) If the cross elasticity of factor demand for a particular group of workers with respect to the price of computers is positive, then those workers and computers are

- a. complements in production.
- b. substitutes in production.
- c. nonproductive inputs.
- d. none of the above.

(5) In the cobweb model of labor markets, a sudden increase in demand for workers causes

- a. permanent excess demand due to rigid wages.
- b. a sudden drop in the wage.
- c. rapid convergence to the new long-run equilibrium wage and employment level.
- d. a sequence of “booms” and “busts.”

(6) Consider a diagram with wages on the vertical axis and risk of injury on the horizontal axis. If for some strange reason workers *preferred* risky jobs to safe jobs, their indifference curves would be

- a. upward-sloping curves.
- b. downward-sloping curves.
- c. upward-sloping 45-degree lines.
- d. vertical lines.
- e. horizontal lines.

(7) The lower a person's discount rate, everything else equal,

- a. the more education the person will choose.
- b. the less education the person will choose.
- c. The discount rate has no effect on the amount of education a person will choose.
- d. Cannot be determined from information given.

(8) The marginal return to schooling is typically estimated to be about

- a. zero.
- b. 0.02.
- c. 0.10.
- d. 0.50.

(9) In recent decades, the relative supply of skilled workers has

- a. increased.
- b. decreased.
- c. remained constant.
- d. fallen to zero.

(10) Over the last century, average wages across U.S. states have

- a. converged.
- b. diverged.
- c. neither converged or diverged.
- d. fallen.

(11) Wages are correlated with job seniority because the typical worker

- a. enjoys returns to specific human capital.
- b. stays with a job that is a good match for the worker's skills.
- c. both (a) and (b).
- d. neither (a) nor (b).

(12) Suppose an employer receives job applications from a blue worker and a green worker with identical education and experience qualifications. If the employer has experienced more frequent quits by blue workers in the past, the employer may offer the job to the green worker. This would be an example of

- a. preference-based employer discrimination.
- b. preference-based employee discrimination.
- c. preference-based customer discrimination.
- d. statistical discrimination.
- e. monopsony wage discrimination.

(13) Unions in the United States today gain the right to represent workers at a workplace by first winning

- a. a lawsuit in a special Labor Court.
- b. a special designation from Congress.
- c. a strike.
- d. a certification election.

(14) A "right-to-work" law is a state law that

- a. allows workers to opt out of joining unions and paying union dues.
- b. requires companies bidding on government contracts to pay "prevailing" union wages.
- c. invalidates the federal minimum wage law.
- d. outlaws unions.

(15) The so-called "Hicks paradox" asserts that

- a. wages set above the competitive level are not Pareto-optimal.
- b. labor demand may slope upward in the presence of a union.
- c. bargaining over wages alone does not result in a Pareto-optimal outcome.
- d. strikes are not Pareto-optimal.

(16) In the U.S., the average union wage gap in the private sector is now roughly

- a. 5%.
- b. 15%.
- c. 25%.
- d. 35%.
- e. 50%.

(17) Which pay scheme can inadvertently lead to deterioration in quality as workers focus on speed?

- a. delayed compensation.
- b. efficiency wages.
- c. piece rates.
- d. time rates.

(18) According to the efficiency-wage explanation for dual labor markets, wages are higher in the primary sector because, in that sector,

- a. jobs require more human capital.
- b. workers are more able.
- c. jobs are more difficult to supervise.
- d. workers are protected by unions.

(19) Which age group usually has the highest unemployment rate?

- a. ages 16-24.
- b. ages 25-34.
- c. ages 35-44.
- d. ages 45-54.
- e. ages 55-64.
- f. ages 65 and over.

(20) If unemployed workers do not have the skills to fill the available jobs, this is called

- a. cyclical unemployment.
- b. frictional unemployment.
- c. seasonal unemployment.
- d. structural unemployment.

(21) Workers voluntarily withdraw briefly from the labor market during recessions because the real wage is lower, according to the

- a. efficiency wages hypothesis.
- b. implicit contracts hypothesis.
- c. intertemporal substitution hypothesis.
- d. sectoral shifts hypothesis.

(22) Unemployment insurance creates an incentive for unemployed workers to

- a. join unions.
- b. avoid jobs prone to seasonal unemployment.
- c. reduce effort at job search.
- d. set a lower reservation wage in their job search.

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**II. Problems:** Please insert your answer to each question in the box provided. You may use margins and graphs for scratch work. Only the answers in the boxes will be graded.

(1) [Individual labor supply—optimal choice: 12 pts] Let  $L$  denote the weekly hours of leisure Aaron enjoys and let  $C$  denote the dollars of consumption. Suppose Aaron's utility function is  $U = (C-100)(L-10)$ . A little calculus shows that his marginal utility of consumption is  $MU_C = L-10$  and his marginal utility of leisure is  $MU_L = C-100$ . He has \$300 in weekly nonlabor income and 60 hours per week available for work or leisure.

- a. Compute Aaron's reservation wage.

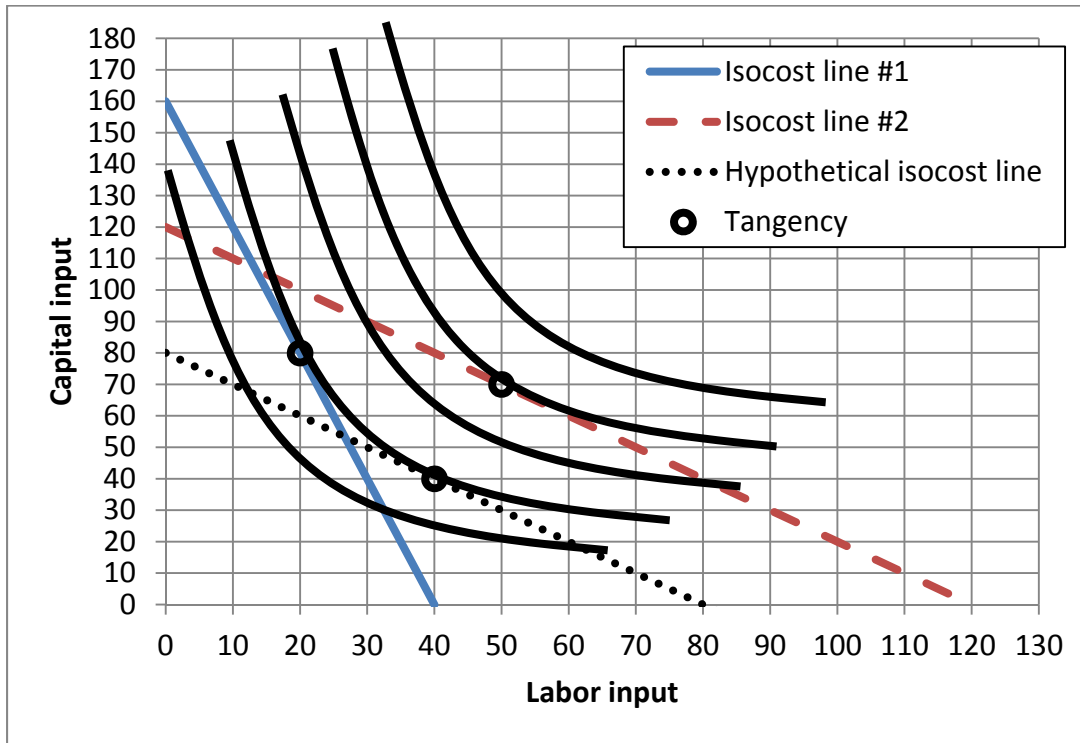
Suppose Aaron can work as many hours as he likes at an hourly wage of \$20 per hour.

- b. Give an equation for his budget constraint in terms of  $L$  and  $C$ .

- c. How much leisure  $L$  and consumption  $C$  will he choose to enjoy?

- d. How many hours will he choose to work?

(2) [LR labor demand – scale and substitution effects: 16 pts] ABC Manufacturing Company uses labor and capital to make coathangers. The graph below shows ABC’s isoquants, two true isocost lines, and one hypothetical isocost line parallel to isocost line #2.



The price of capital used by ABC is always \$10. However, the wage (the price of labor) changes.

- Initially, ABC is on isocost line #1. What is the wage on isocost line #1?
- Then in response to a change in the price of labor, ABC moves to isocost line #2. What is the wage on isocost line #2?

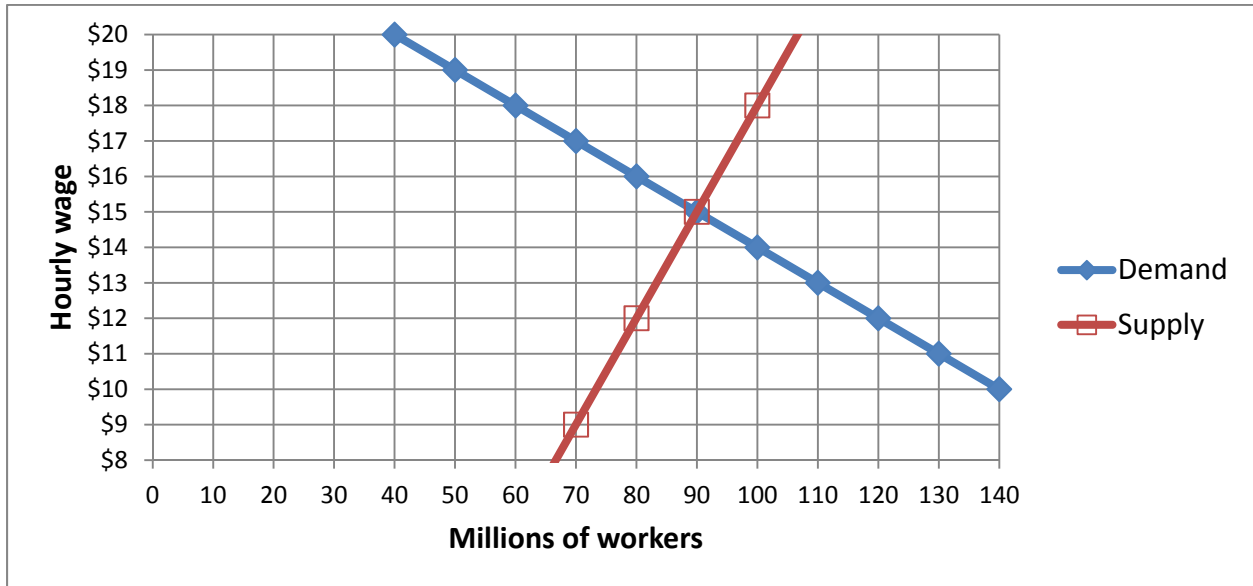
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Consider the effects of this change in the wage on ABC’s use of labor input.

- Does the substitution effect cause ABC to use *more* labor or *less* labor input?
- How much? That is, give the change in labor input caused by the substitution effect of the wage change.
- Does the scale effect cause ABC to use *more* labor or *less* labor input?
- How much? That is, give the change in labor input caused by the scale effect of the wage change.
- Does the total effect cause ABC to use *more* labor or *less* labor input?
- How much? That is, give the change in labor input caused by the total effect of the wage change.

	units
	units
	units

(3) [Payroll tax or subsidy: 14 pts] The graph below shows demand and supply for workers in a particular labor market.



Suppose the government gives a **payroll subsidy of \$ 4** per hour.

- Find the new level of employment.
- Find the new net labor cost per hour paid by employers (excluding the subsidy).
- Find the new total wage per hour received by workers (including the subsidy).
- Compute the gain in employer surplus as a result of the subsidy (per hour).
- Compute the gain in worker surplus as a result of the subsidy (per hour).
- Compute the total direct cost of the subsidy program to the government (per hour).
- Compute the deadweight loss caused by the subsidy (per hour).

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\$	
\$	million
\$	million
\$	million
\$	million

(4) [VSL, safety regulation: 12 pts] The following regression equation has been fitted to data on a large sample of workers:

$$\text{annual earnings} = -7,566 + 3,392 S + 48 R$$

where  $S$  = total education in years, and  $R$  = annual occupational death rate per 100,000 workers.

- a. Compute the value of a statistical life implied by these estimates. Show your work and circle your final answer.

Suppose a particular factory employs a large number of workers. A special circuit-breaker system, designed to reduce workers' exposure to high voltage, would cost \$800,000 per year. It is estimated that the system would reduce the factory's average annual death rate from 1.4 to 1.3 persons per year.

- b. Compute the cost of the system per statistical life saved. Show your work and circle your final answer.

- c. Given the numbers you have computed above, should the system be required? Why or why not?

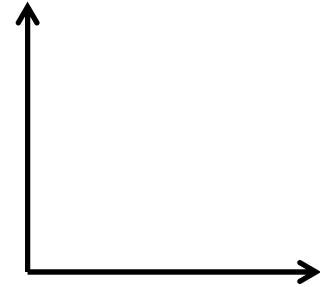
(5) [Immigration surplus: 8 pts] Suppose short-run demand for workers in the U.S. is given by

$$w = 25 - 0.1 E$$

where  $w$  denotes the hourly wage and  $E$  denotes employment (in millions). Suppose there are 120 million domestic U.S. workers who supply labor inelastically. Suppose also that 40 million workers would enter the U.S. and supply labor inelastically if the U.S. allowed free immigration. Compute the following. [Hint: You may wish to sketch a graph.]

- Compute the equilibrium wage without immigration.
- Compute the equilibrium wage with free immigration
- Compute the immigration surplus—the net benefit to domestic U.S. workers and employers from free immigration (per hour).
- Compute the amount of surplus that would be transferred from U.S. workers to U.S. employers under free immigration (per hour).

\$	
\$	
\$	million
\$	million



(6) [Oaxaca decomposition: 6 pts] Suppose that for green workers, the relationship between schooling and the hourly wage is given by  $\ln(\text{wage}_G) = 1.0 + 0.12 S_G$ . For blue workers, the relationship is  $\ln(\text{wage}_B) = 0.9 + 0.10 S_B$  due to discrimination in the labor market. On average, green workers have 15 years of schooling, while blue workers have 14 years.

- Compute the raw log wage differential—that is,  $\overline{\ln(\text{wage}_G)} - \overline{\ln(\text{wage}_B)}$ .

- Compute the log wage differential due to schooling.

- Compute the log wage differential due to discrimination in the labor market, in Oaxaca's definition.

(7) [Monopsony wage discrimination: 16 pts] A certain employer enjoys monopsony power over two groups of workers. Supply of green workers to this employer is given by  $w_G = 6 + (E_G/10)$ . Supply of blue workers to the same employer is given by  $w_B = 2 + (E_B/5)$ . The value of marginal product of all workers is constant and equal to \$20.

- a. Recall that if labor supply is a straight line, then marginal labor cost is also a straight line, with the same intercept and twice the slope of labor supply. Give the equation for marginal labor cost for each group of workers.

$$MLC_G =$$

$$MLC_B =$$

- b. What level of employment ( $E_G$  and  $E_B$ ) will the employer choose for each group?

- c. What wage ( $w_G$  and  $w_B$ ) will the employer pay each group?

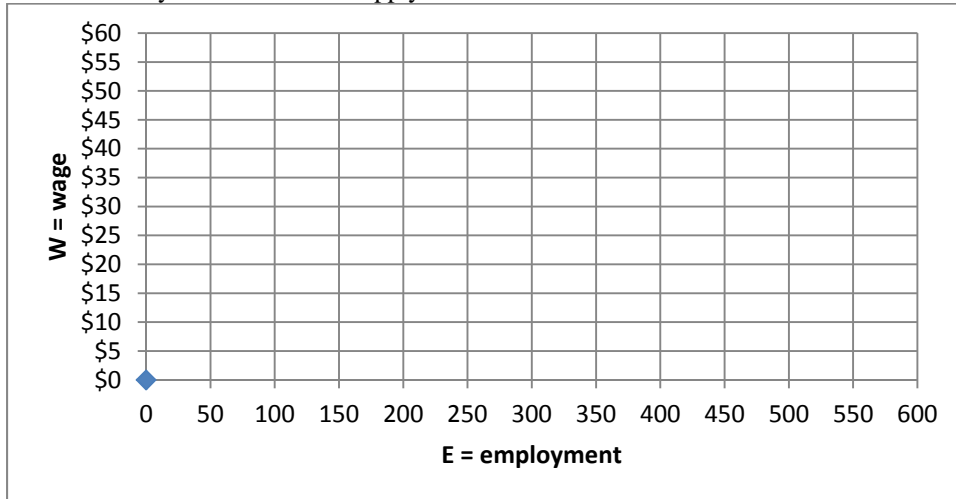
- d. Suppose the government imposes a minimum wage of \$15 for all workers. Now what level of employment ( $E_G$  and  $E_B$ ) will the employer choose for each group?



(8) [Monopoly unionism: 10 pts] Suppose labor demand (VMP) by a particular firm is given by  $W = 60 - 0.1 E$ , where  $W$  is the hourly wage and  $E$  is employment (number of workers). The competitive wage is  $W_C = \$15$ .

a. Compute the competitive level of employment. Show your work and circle your final answer.

b. Using a straightedge, graph and label the labor demand curve in the graph below. Also plot a horizontal line at  $W_C$ , which is effectively the firm's labor supply curve.



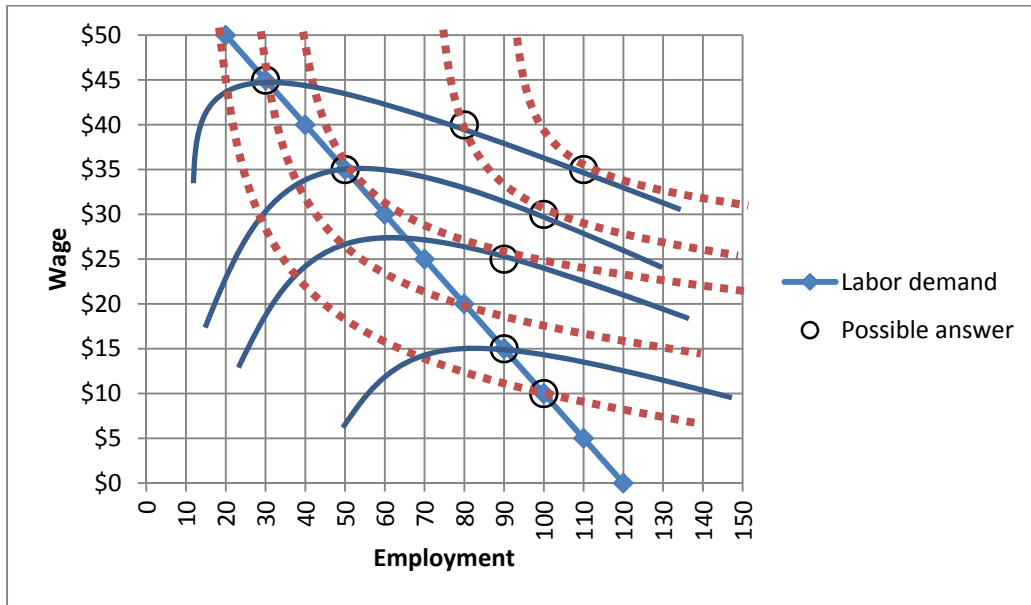
First, assume the firm faces a monopoly union, whose utility function is given by  $U = W \times E$ . (This assumption is sometimes called “wage-bill maximization.”) A little calculus shows that the union's marginal utility of employment is  $MU_E = W$  and its marginal utility of wages is  $MU_W = E$ .

c. Compute the wage set by the union and the resulting level of employment. [Hint: Set the union's  $MRS = MU_E/MU_W$  equal to the |slope| of the labor demand curve.] Show your work and circle your final answers.

d. Plot this outcome in the graph above and label it “Wage-bill max.”

e. Compute the efficiency loss from this outcome. Circle your final answer.

(9) [Efficiency bargaining: 8 pts] The graph below shows a labor demand curve (or VMP curve) for a firm. The solid curves are the firm's isoprofit curves. The dotted curves are the union's indifference curves. Choose answers to the questions below from among the circled points on the graph.



First suppose the union is a *monopoly*, setting the wage unilaterally and then allowing the firm to choose employment.

- a. What wage will the union choose? What level of employment will the firm choose in response?

W= \$	E=
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Now suppose the union and the firm engage in *efficient bargaining*, choosing the wage and the employment level simultaneously.

- b. Find an efficient combination of wage and employment that will be just as good for the firm as your answer to (a), and better for the union than your answer to (a).
- c. Find an efficient combination of wage and employment that will be just as good for the union as your answer to (a), and better for the firm than your answer to (a).
- d. List one other efficient combination of wage and employment and **sketch the contract curve in the graph.**

W= \$	E=
W= \$	E=
W= \$	E=

(10) [Union wage effects: 6 pts] Suppose an industry initially pays a wage of \$10 per hour. Then part of the industry becomes unionized. The unionized part then pays \$15 per hour while the nonunion part pays \$12. Assume nothing else changes except unionism.

- a. Compute the *wage gain* due to unionism.
- b. Compute the *wage gap* due to unionism.

	%
	%

- c. Does the change in the nonunion wage indicate *threat effects* or *spillover effects*? Explain your reasoning.

(11) [Piece rates and time rates: 10 pts] Brenda assembles toys at two possible employers. Firm #1 pays a piece rate: **\$0.30 per toy**. Firm #2 simply pays a time rate of **\$12 per hour** and fires anyone who does not assemble at least 30 toys per hour.

Brenda's marginal cost of effort to assemble toys is  $MC = 0.002 N + 0.2$ , where N is the number of toys assembled per hour. It can be shown using integral calculus that Brenda's total cost of effort per hour is  $TC = 0.001 N^2 + 0.2 N$ . Suppose Brenda worked at Firm #1.

- a. How many toys would she assemble per hour?
- b. What would be her hourly pay?
- c. What would be her net benefit at Firm #1 (that is, hourly pay minus total cost of effort per hour).

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Suppose Brenda worked at Firm #2.

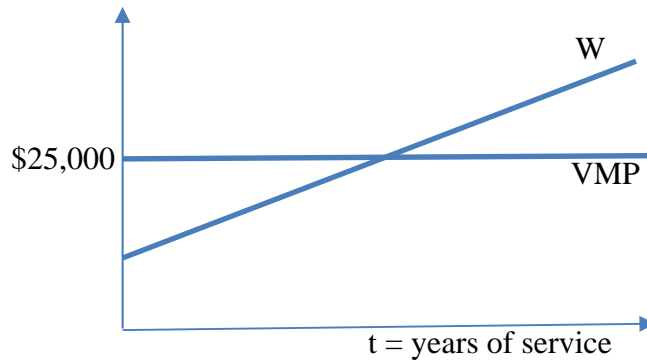
- d. What would be her net benefit at Firm #2 (that is, hourly pay minus total cost of effort per hour).
- e. Which employer will Brenda prefer?

	\$

(12) [Mandatory retirement: 12 pts] Suppose a firm uses delayed compensation to discourage shirking. The workers' VMP is constant at \$25,000 per year, but the firm instead pays a wage of

$$W = (\$14,000 + 500t)$$

where  $t$  denotes years of service with the firm. To simplify calculations, assume that workers' discount rate is 0%, and that wages are adjusted continuously rather than once a year. Use the graph at right for scratch work.



a. After how many years of service does the wage equal VMP? Show your work and circle your final answer.

b. After how many years of service will the firm want to impose mandatory retirement? [Hint: This is the value of  $t$  where the area under the  $W$  curve equals the area under the  $VMP$  curve.] Show your work and circle your final answer.

c. Assume that the firm is able to impose mandatory retirement somehow, as computed in part (b). Suppose a worker were fired after only 20 years of service and forced to take another job at \$25,000 for the rest of her career. How much would the worker lose in total? Show your work and circle your final answer.

(13) [Markov model: 10 pts] Suppose people move between employment and unemployment every month according to the following Markov transition matrix. Note that two numbers are missing.

		To	
		Employment	Unemployment
From	Employment	(a)	0.02
	Unemployment	0.48	(b)

- a. What number belongs in place of (a)?
- b. What number belongs in place of (b)?
- c. What percent of employed people lose or leave their jobs or every month?
- d. What percent of unemployed people find jobs every month?
- e. Compute the steady-state unemployment rate.

	%
	%
	%

(14) [Job search: 10 pts] An unemployed worker is searching for a job. Suppose the marginal benefit of further search, as a function of the wage offer in hand, is  $MB = 50 - 2w$ , and the marginal cost of further search, as a function of the wage offer in hand, is  $MC = 2 + w$ .

a. What is the worker's reservation wage?

b. Would the worker accept a job at \$15 per hour? Why or why not?

Suppose unemployment insurance benefits were *decreased*.

c. Which curve would shift: MB or MC? Why?

d. Would the reservation wage increase or decrease? Why?

e. Would the average time to find a new job increase or decrease? Why?

**III. Critical thinking:** Write a one-paragraph essay answering *only one* question below (your choice). [6 pts]

- (1) Suppose a worker enjoys an increase in her hourly wage. As a result, she may decide to change her hours of work. What two “effects” of the wage increase will influence her decision? Do those “effects” tend to increase or decrease her hours of work?
- (2) Suppose a manager is considering a change in the way she pays her sales workers. Instead of simply paying them by the hour, she is considering paying them according to the number of units they sell in a “tournament” pay scheme. The top-ranked sales worker would get a large bonus, the second-ranked sales worker would get a smaller bonus, and so forth. The manager asks you for advice.
  - a. What are the advantages of a “tournament” pay scheme over straight hourly pay?
  - b. What is one disadvantage?

Circle the question you are answering and write your answer below. Full credit requires correct economic reasoning, legible writing, good grammar including complete sentences, and accurate spelling.

[end of exam]