EXAMINATION 1 VERSION A
"Labor Supply and Demand"
February 21, 2017

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. [1 pts each, 11 pts total]

(1) Excess supply in the labor market indicates that the actual wage is
a.   above the equilibrium wage.
b.   below the equilibrium wage
c.   equal to the equilibrium wage.
d.   Cannot be determined from information given.

(2) A person who is not currently working, but last looked for a job two weeks ago, would be classified in the U.S. as
a.   employed.
b.   unemployed.
c.   out of the labor force.

(3) Which group experienced the largest increase in labor force participation from1950 to 2000?
a.   older men.
b.   married men.
c.   older women.
d.   married women.

(4) On a graph with consumption on the vertical axis and leisure hours on the horizontal axis, indifference curves must slope down because
a.   the lower the wage, the more leisure people will choose.
b.   people value both consumption and leisure.
c.   price and quantity are negatively related, according to the Law of Demand.
d.   the more leisure people enjoy, the less money they have for spending on consumption.

(5) 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.
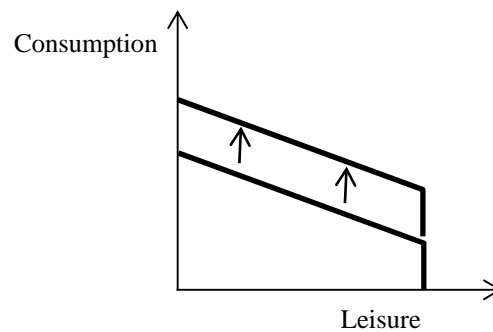
(6) If for a particular worker, the income effect is stronger than the substitution effect, then the worker's labor supply curve
a.   slopes up.
b.   bends backward.
c.   is vertical.
d.   is horizontal.

(7) Suppose people in group A become eligible for a job training program, but people in group B do not. Labor-force participation rates for both groups before and after the training program was started are given below.

	Group A	Group B
Before program	50%	45%
After program	53%	46%

The difference-in-differences estimator of the effect of the program on labor-force participation is
a.   an increase of 1%.
b.   an increase of 2%.
c.   an increase of 3%.
d.   an increase of 5%.
e.   an increase of 7%.

(8) A firm that is a "price-taker"
a.   takes its price to whatever level will maximize profit.
b.   assumes the market price is given.
c.   sets prices for other firms in the market.
d.   none of the above.

(9) If the wage is greater than the value of marginal product of labor, the firm can increase profit by
a.   hiring more labor.
b.   hiring less labor.
c.   it cannot increase its profit by changing its labor input by small amounts.
d.   any of the above.

(10) If only one firm suffers a wage increase, it will reduce its employment of labor _____ it would if all firms in the same industry suffered a wage increase.
a.   more than.
b.   less than.
c.   just as much as.

(11) 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.

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) [Regression analysis: 6 pts] Let W denote the hourly wage received by a worker. Let S denote the number of years of schooling that the same worker has completed. The following model has been estimated by the method of least-squares regression, using data on several hundred workers. The numbers in parentheses are standard errors.

$$\ln(W) \;=\; 1.15 \;+\; 0.15\,S$$
$$\quad\;\;(0.06)\quad\;(0.10)$$

a. If a worker has 12 years of schooling, what value of "ln(W)" would she or he have, on average?

b. According to these results, if schooling increases by one year, regardless of the original level of the wage, then how much does the wage increase? (Be sure to include either a % sign or a $ sign.)

c. Is the coefficient of schooling statistically significant by the usual standards? Why or why not?

(2) [Measuring the labor force: 8 pts] The U.S. Bureau of Labor Statistics reported that in January 2016, 150.5 people were employed, 7.8 million people were unemployed, and 94.0 million working-age people were not in the labor force.

a. Compute the working-age population to the nearest tenth of a million.

b. Compute the unemployment rate to the nearest tenth of a percentage point.

c. Compute the employment rate (or employment-to-population ratio) to the nearest tenth of a percentage point.

d. Compute the labor force participation rate to the nearest tenth of a percentage point.

	million
	%
	%
	%

(3) [Budget constraint: 6 pts] Suppose Alice has 60 hours of time available each week for work or leisure, enjoys weekly nonlabor income of $100, and can earn a wage of $10 per hour. However, if Alice's total income exceeds $500 per week, she faces a marginal tax rate of 50%. In other words, her first $500 of income is not taxed, but any income above $500 is taxed at a rate of 50%. *Using a straightedge,* draw a graph of Alice's weekly budget constraint. Label the endowment point and any other kink points.
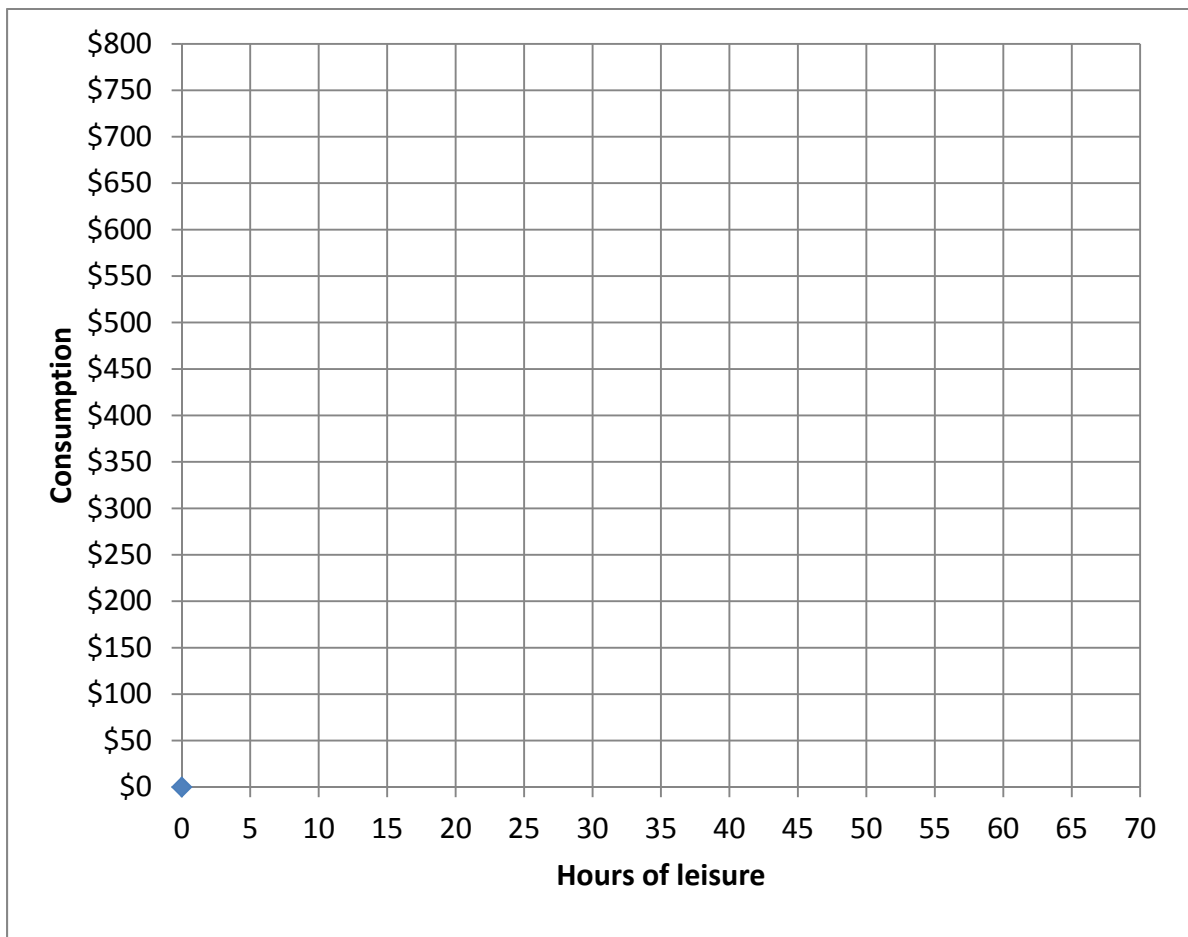
(4) [Individual labor supply—optimal choice: 12 pts] Let L denote the weekly hours of leisure Aaron enjoys and let C denote the dollars of consumption. Suppose Aaron's utility function is $U = (C-100)(L-10)$. A little calculus shows that his marginal utility of consumption is $MU_C = L-10$ and his marginal 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?

(5) [Individual labor supply—income and substitution effects: 22 pts] The graph below shows Amanda's indifference curves, two true budget lines, and one hypothetical budget line parallel to budget line #1.
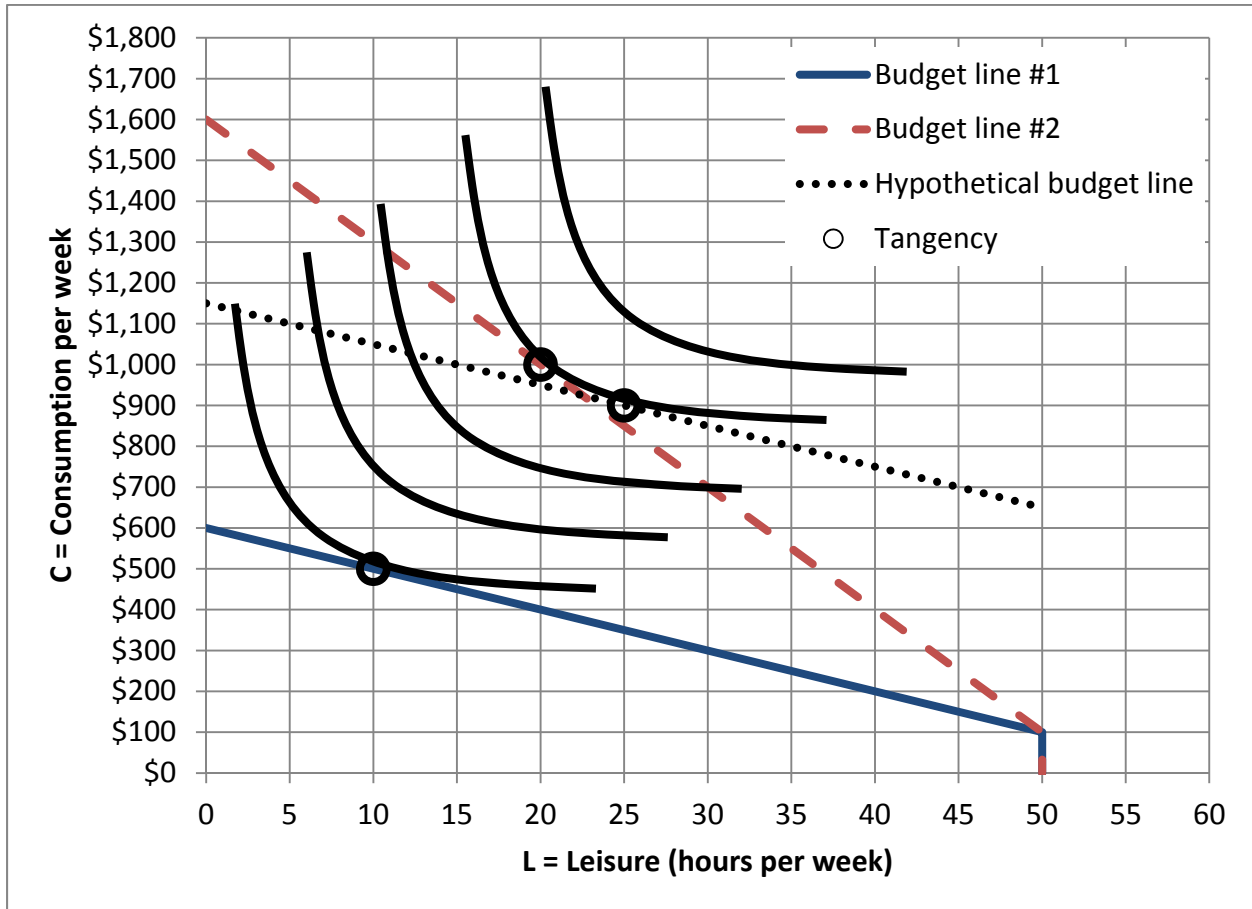
a. According to this graph, what is Amanda's total available time for work or leisure?

	hours

b. How much nonlabor income does Amanda enjoy?

$	

c. What is Amanda's wage rate on budget line #1?

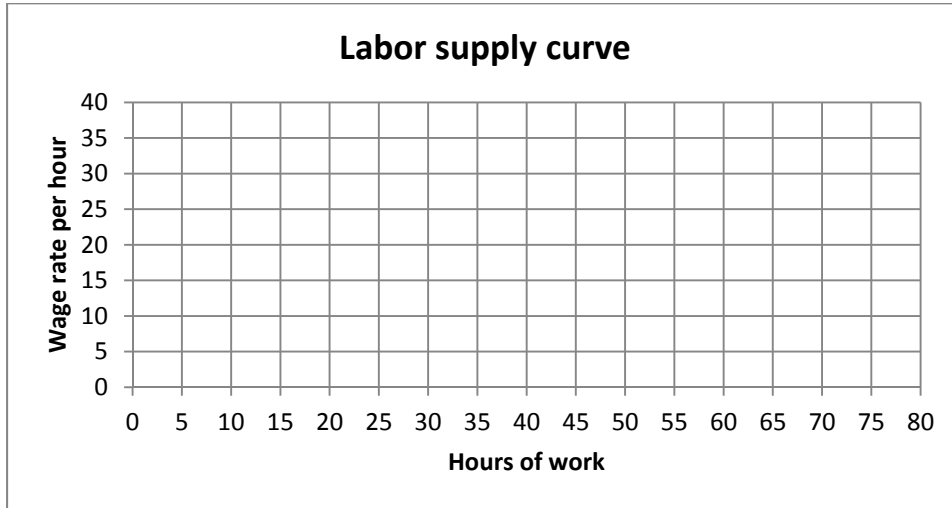| $	per hour

d. What is Amanda's wage rate on budget line #2?

$	per hour

Consider Amanda's response to the change in the wage rate from budget line #1 to budget line #2.

e. Does the *income effect* of this change cause Amanda to work *more* or to work *less*?

f. Compute the change in hours of work due to the *income effect* alone.

	hours

g. Does the *substitution effect* of this change cause Amanda to work *more* or to work *less*?

h. Compute the change in hours of work due to the *substitution effect* alone.

	hours

i. Does the *total effect* of this change cause Amanda to work *more* or to work *less*?

j. Compute the total change in hours of work caused by the change in the wage rate.

	hours

k. Using the information in this indifference-curve graph, plot two points on Amanda's *labor supply curve* in the graph below and sketch the curve.

Labor supply curve

(graph with y-axis "Wage rate per hour" ranging 0 to 40 in increments of 5, x-axis "Hours of work" ranging 0 to 80 in increments of 5)

(6) [SR labor demand: 9 pts] Suppose United Manufacturing Company has the following production function.
$$q = 2 \, (K \, E)^{1/2} \, .$$
A little calculus shows that the marginal product of labor is
$$MP_E = (1) \, (K/E)^{1/2} \, .$$
The price of output is $25, the wage is $10 per hour, and the price of capital is $50. The capital stock is fixed at K=32 units.

a. How much labor E should United employ in the short run?

b. How much output q will United produce?

c. How much profit will United enjoy?

(7) [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.
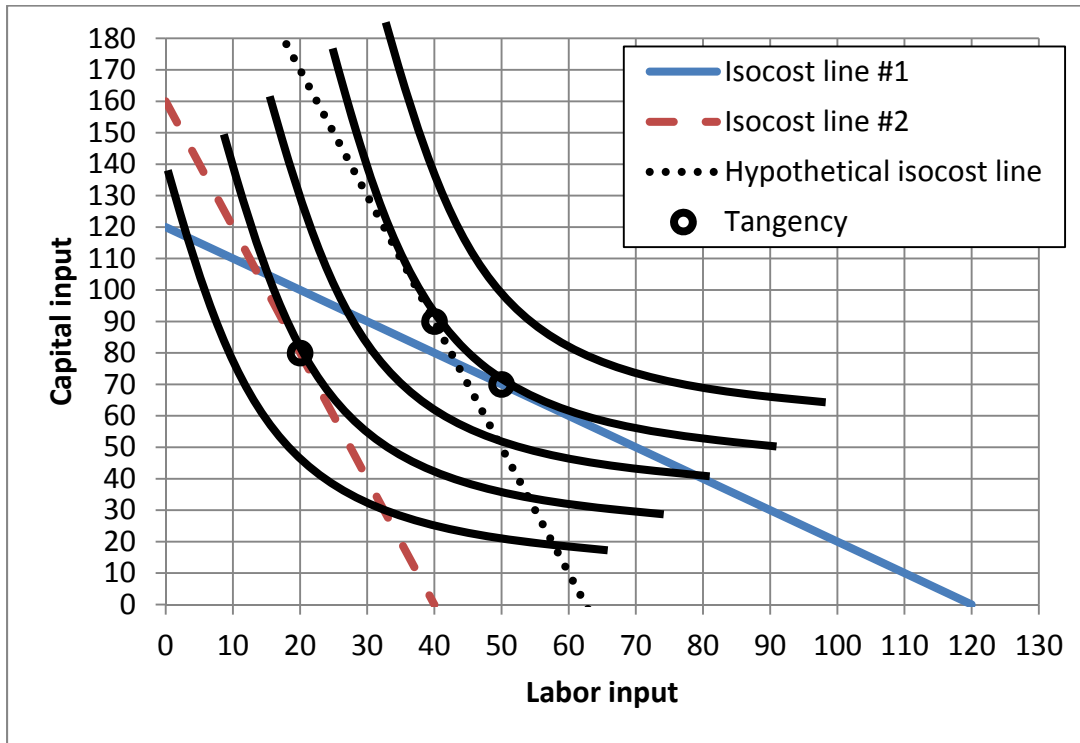
The price of capital used by ABC is always $10. However, the wage (the price of labor) changes.

a. Initially, ABC is on isocost line #1. What is the wage on isocost line #1? $

b. 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? $

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

c. Does the substitution effect cause ABC to use *more* labor or *less* labor input?

d. How much? That is, give the change in labor input caused by the substitution effect of the wage change.   units

e. Does the scale effect cause ABC to use *more* labor or *less* labor input?

f. How much? That is, give the change in labor input caused by the scale effect of the wage change.   units

g. Does the total effect cause ABC to use *more* labor or *less* labor input?

h. How much? That is, give the change in labor input caused by the total effect of the wage change.   units
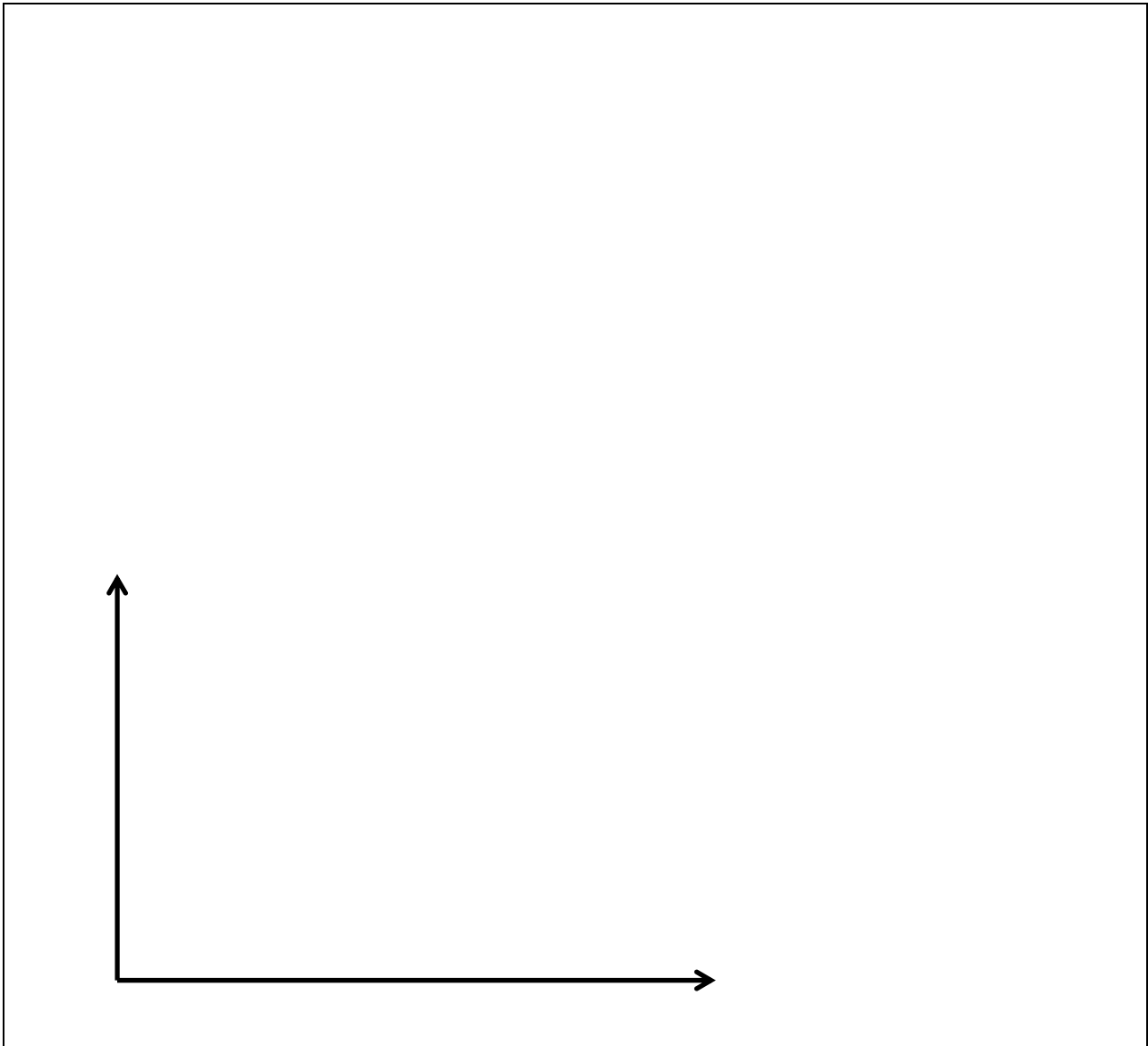
(8) [Hicks-Marshall rules: 6 pts]

    a. Industry X and Industry Y are similar, except that labor's share of total cost is 60% in industry X and 40% in industry Y. Which industry will have *more elastic demand for labor*, according to the Hicks-Marshall rules?[1]

    b. Industry W and Industry Z are similar, except that the elasticity of substitution of labor for capital is 0.7 in Industry W and 1.5 in Industry Z. Which industry will have *more elastic demand for labor*, according to the Hicks-Marshall rules?

    c. Industry S and Industry T are similar, except that the elasticity of demand for their products is different. The elasticity of demand for the product of Industry S is -2.4. The elasticity of demand for the product of Industry T is -1.7. Which industry will have *more elastic demand for labor*, according to the Hicks-Marshall rules?

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[1] Assume as usual that in both industries, the elasticity of product demand is larger in absolute value than the elasticity of substitution in production.

III. Critical thinking: Write a one-paragraph essay answering *only one* question below (your choice). [4 pts]

(1) Suppose Yolanda expects to enjoy a constant wage of $30 per hour from age 25 to age 65. Meanwhile, Xavier expects his wage to rise gradually from $10 per hour at age 25, to $30 at age 45, to $50 at age 65. Assume that Yolanda and Xavier have the same nonlabor income and preferences for leisure and consumption. Will Yolanda and Xavier have similar life-cycle paths of hours of work? Why or why not? Illustrate your answer by drawing graphs of annual hours of work against age for both people.

(2) Over the last 100 years, average household income has increase substantially in the U.S. Meanwhile, over the same period, the total fertility rate (the average number of children born to a woman during her lifetime) has fallen in the U.S. from three children per woman to two children per woman. Does this suggest that children are inferior goods? Why or why not? Explain your answer with an indifference-curve diagram.

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. Label all curves and axes.

[end of exam]