

EXAMINATION 1 VERSION C
"Labor Supply and Demand"
February 24, 2014

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. Numerical answers, if rounded, must be correct to at least 3 significant digits. 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) A person who worked three hours last week for pay would be classified in the U.S. as
- employed.
 - unemployed.
 - out of the labor force.
- (2) On a graph with consumption on the vertical axis and leisure hours on the horizontal axis, an indifference curve connects combinations or bundles that
- have the same marginal rate of substitution.
 - yield the same total income.
 - cost the same amount.
 - are equally preferred.
- (3) If a person chooses to work any hours at all, then at that person's optimal bundle, the marginal rate of substitution equals
- dollars of consumption.
 - hours of leisure.
 - nonlabor income.
 - utility.
 - the wage.
- (4) Economic theory predicts that the higher the market wage, necessarily
- the fewer the average hours of work for those people already working.
 - the greater the average hours of work for those people already working.
 - the fewer people will choose to work.
 - the more people will choose to work.
- (5) Consider a cash grant welfare program, where a person is given \$3000 that must be forfeited if the person has any labor earnings. According to economic theory, this program would cause
- an increase in work hours by those already working.
 - a slight decrease in work hours by those already working.
 - an increase in labor force participation.
 - a decrease in labor force participation.
- (6) A dynamic model of labor supply predicts that, in periods where the wage is lower, labor force participation and hours of work will be lower because a temporary change in the wage
- creates only an income effect.
 - creates only a substitution effect.
 - creates both an income effect and a substitution effect.
 - creates neither an income effect nor a substitution effect.
- (7) The modern economic theory of fertility attributes falling fertility rates to
- rising worker productivity.
 - increased selfishness of potential parents.
 - increases in income.
 - increases in the "price" or cost of raising children.
- (8) When all firms in an industry enjoy a wage decrease, they each increase their labor input less than they would if only one firm enjoyed the wage decrease because
- the capital stock is reduced.
 - the production function shifts down.
 - it is harder to find workers.
 - the output price falls.

(9) The absolute value of the slope of an isoquant is called the

- a. marginal rate of technical substitution.
- b. input price ratio.
- c. marginal utility.
- d. marginal product.

(10) According to the Hicks-Marshall rules, labor demand is more elastic in the long run,

- a. the greater the level of total output.
- b. the greater the elasticity of labor supply.
- c. the greater the capital/labor ratio.
- d. the larger the share of labor in total cost.
- e. all of the above.

(11) According to the “spillover” model, an increase in the wage in the covered sector will

- a. increase labor demand in the covered sector.
- b. increase labor demand in the uncovered sector.
- c. increase labor supply to the covered sector.
- d. increase labor supply to the uncovered sector.

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.

$$\ln(W) = 1.02 + 0.10 S$$

(0.04) (0.03)

a. If a worker has 14 years of schooling, what value of “ $\ln(W)$ ” would she or he have, on average?

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

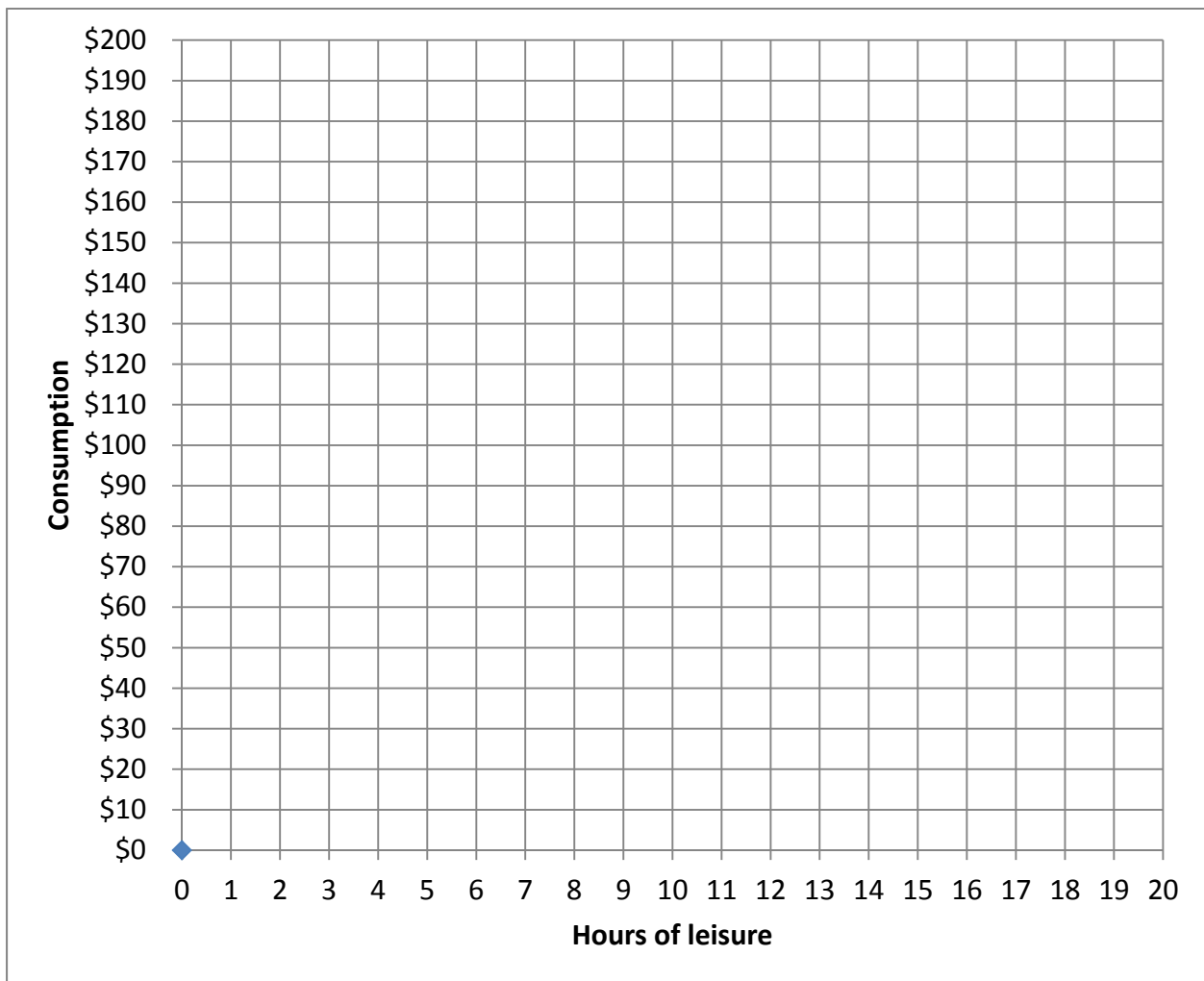
c. According to these results, if schooling increases by one year, then how much does the *wage* increase?

(2) [Measuring the labor force: 8 pts] The U.S. Bureau of Labor Statistics reported that in August 2008, 14.9 million people were unemployed, 139.3 million people were employed, and 84.0 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] (4.6) Suppose Caitlin has 16 hours of time available each DAY for work or leisure, has no nonlabor income, and can earn a wage of \$10 per hour. However, if Caitlin chooses to work at all, she must sacrifice two hours of leisure for travel to and from work (one hour each direction). Travel time is not paid. Draw a graph of Caitlin's daily budget constraint. Label the endowment point and any other kink points.



(4) [Optimal choice: 8 pts] Let L denote the weekly hours of leisure Caleb enjoys and let C denote the dollars of consumption. Suppose Caleb's utility function is $U = (C-100)(L-10)$, so that his marginal utility of consumption is $MU_C = L-10$ and his marginal utility of leisure is $MU_L = (C-100)$. He has \$150 in weekly nonlabor income. He has 60 hours per week available for work or leisure.

a. Compute Caleb's reservation wage.

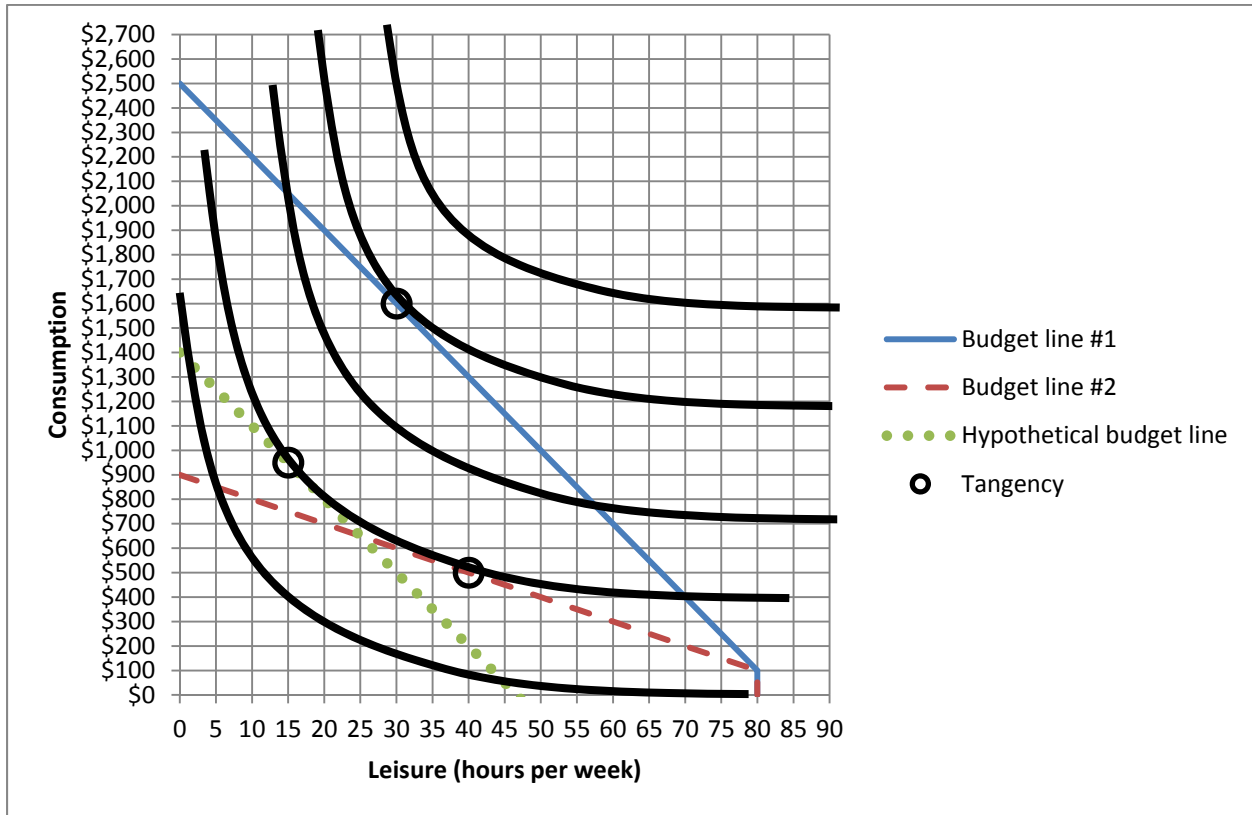
Suppose Caleb can work as many hours as he likes at an hourly wage of \$25 per hour.

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 Carolina’s indifference curves, two true budget lines, and one hypothetical budget line parallel to budget line #1.



- a. According to this graph, what is Carolina’s total available time for work or leisure?
- b. How much nonlabor income does Carolina enjoy?
- c. What is Carolina’s wage rate on budget line #1?
- d. What is Carolina’s wage rate on budget line #2?

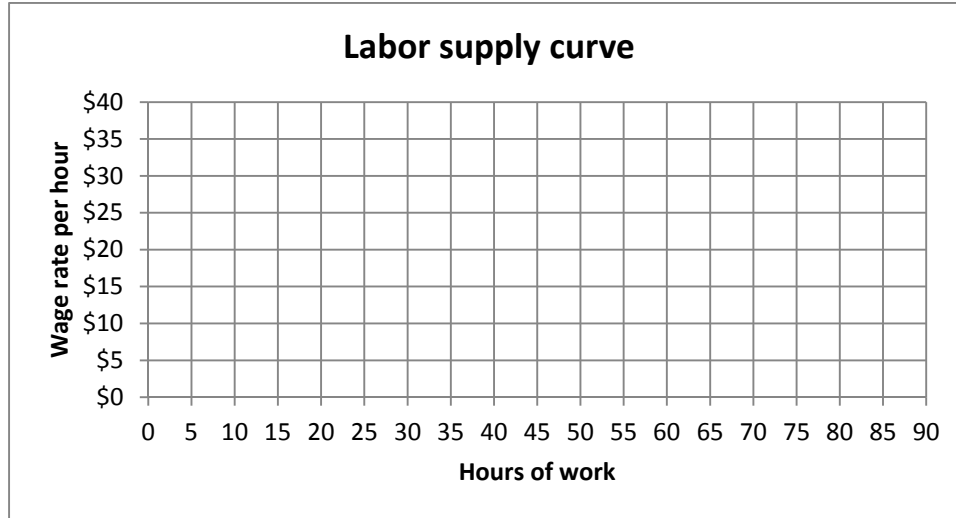
	hours
\$	
\$	per hour
\$	per hour

Consider Carolina’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 Carolina to work *more* or to work *less*?
- f. Compute the change in work due to the *income effect* alone.
- g. Does the *substitution effect* of this change cause Carolina to work *more* or to work *less*?
- h. Compute the change in work due to the *substitution effect* alone.
- i. Does the *total effect* of this change cause Carolina to work *more* or to work *less*?
- j. Compute the total change in work caused by the change in the wage rate.

	hours
	hours
	hours
	hours

k. Using the information in this indifference-curve graph, plot two points on Carolina’s *labor supply curve* in the graph on the next page.



(6) [SR labor demand: 9 pts] Suppose Capstone Products Company has the following production function.

$$q = 2 K^{1/2} E^{1/2}$$

so that the marginal product of labor is

$$MP_E = (K/E)^{1/2}.$$

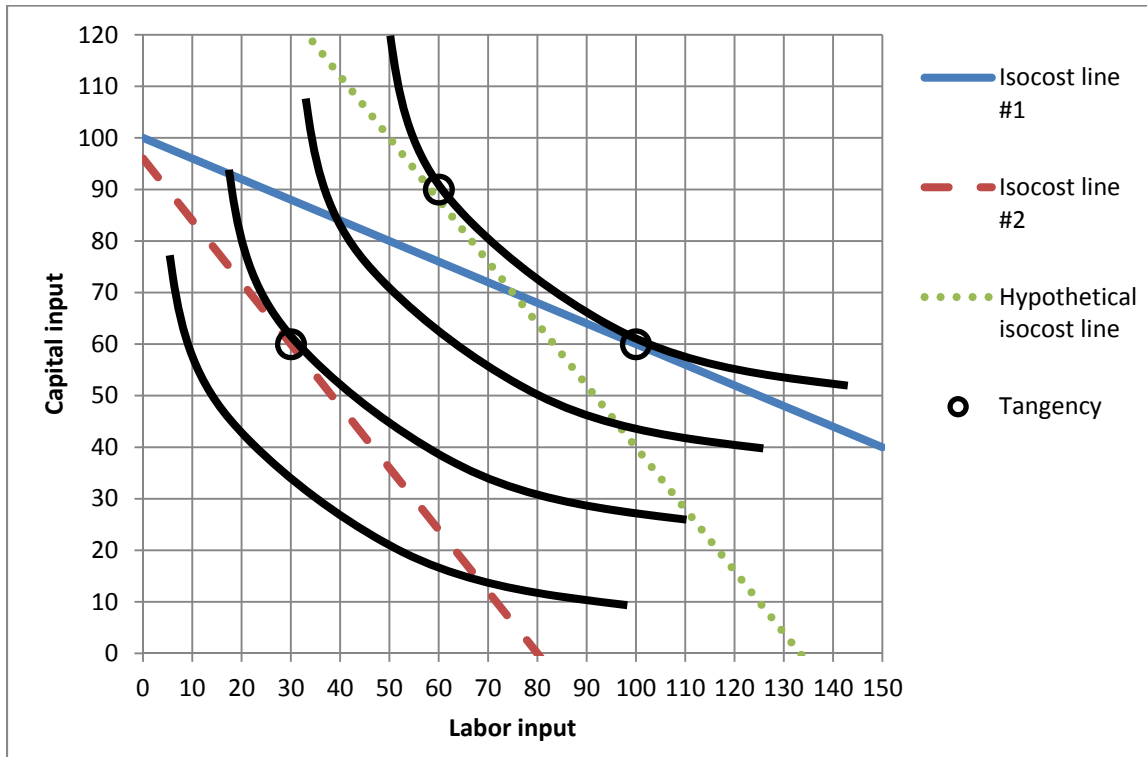
The price of output is \$20, the wage is \$15 per hour, and the price of capital is \$20. The current capital stock is fixed at $K=81$ units.

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

b. How much output q will Capstone produce?

c. How much profit will Capstone earn?

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



The price of capital used by Chicago is always \$20. However, the wage (the price of labor) changes.

a. Initially, Chicago 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, Chicago moves to isocost line #2. What is the wage on isocost line #2?

\$

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

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

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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 Chicago to use *more* labor or *less* labor input?

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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 Chicago to use *more* labor or *less* labor input?

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h. How much? That is, give the change in labor input caused by the total effect of the wage change.

units

(8) [LR labor demand: 8 pts] Last week, the Congressional Budget Office released a report on likely effects of an increase in the federal minimum wage. The following is a quote from that report, with key words deleted. Use the theory of labor demand to fill in each of the blanks.

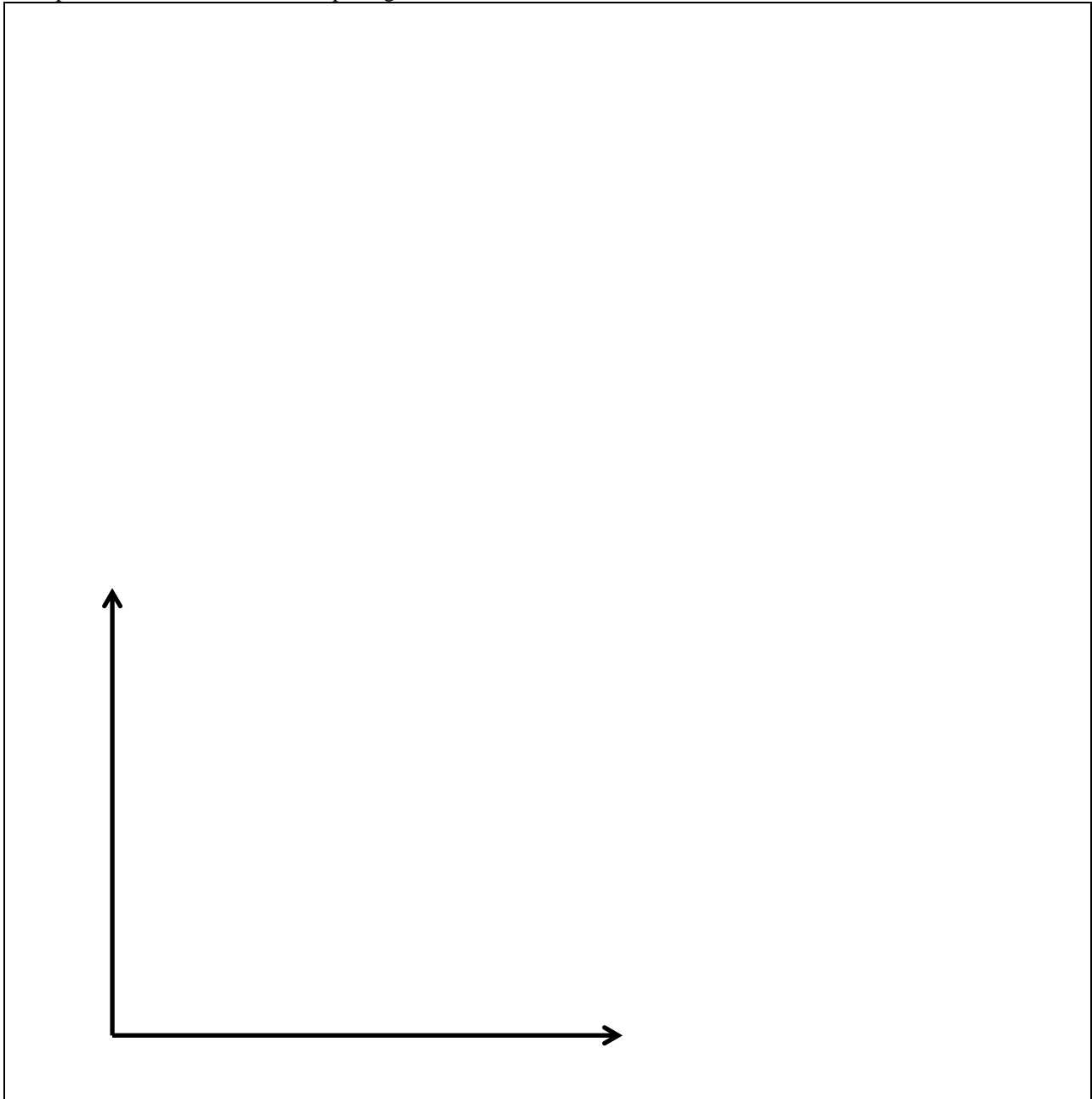
“According to conventional economic analysis, increasing the minimum wage _____ employment in two ways. First, higher wages increase the cost to employers of producing goods and services. The employers pass some of those increased costs on to consumers in the form of higher prices, and those higher prices, in turn, lead the consumers to purchase fewer of the goods and services. The employers consequently produce fewer goods and services, so they hire _____ workers. That is known as a _____ effect, and it _____ employment among both low-wage workers and higher-wage workers.

“Second, a minimum-wage increase raises the cost of low wage workers relative to other inputs that employers use to produce goods and services, such as machines, technology, and more productive higher-wage workers. Some employers respond by _____ their use of low-wage workers and shifting toward those other inputs. That is known as a _____ effect, and it _____ employment among low-wage workers but _____ it among higher-wage workers.”

III. Critical thinking: Write a one-paragraph essay answering the question below. [6 pts]

- (1) Some people claim that they would still work even if they were not paid. Suppose a worker has 60 hours of time available each week for work or leisure and enjoys weekly nonlabor income of \$200.
- Draw the person's budget constraint with a wage of zero.
 - Draw an indifference curve showing that, even if this person were unpaid, she would choose to work 20 hours a week.
 - What is wrong with this indifference curve? That is, what aspect of this indifference curve violates our usual assumptions about preferences?

Write your answer below. Full credit requires correct economic reasoning, legible writing, good grammar including complete sentences, and accurate spelling.



[end of exam]