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EXAMINATION 1 VERSION B
## "Labor Supply and Demand"
February 24, 2022

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, 13 pts total]

(1) If the wage is lower than the equilibrium wage for some reason, then the labor market will experience
a.   excess demand.
b.   excess supply.
c.   both of the above.
d.   none of the above.

(2) Recently, the wages of child-care workers have increased and the number employed has decreased. This could have been caused by
a.   a rightward shift in the supply of child-care workers.
b.   a leftward shift in the supply of child-care workers.
c.   a rightward shift in the demand for child-care workers.
d.   a leftward shift in the demand for child-care workers.

(3) Which labor demand curve below is *more* elastic?
a.   Demand curve A.
b.   Demand curve B.
c.   Both have the same elasticity because they pass through the same point.
d.   Cannot be determined from information given.
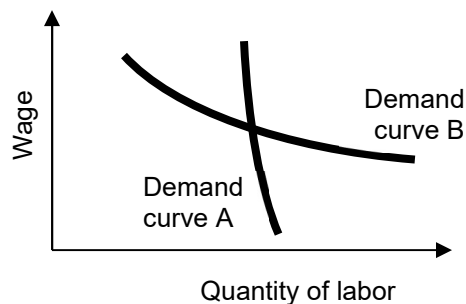
(4) Suppose $\log(W) = 8.0 + 0.075\,S$. If S increases by one unit, then
a.   W increases by about 0.075 units.
b.   W increases by about 7.5 percent.
c.   W increases by about 0.08 units.
d.   W increases by about 8 percent.
e.   W increases by about 0.08 percent.

(5) A coefficient estimate in a regression equation is conventionally considered statistically significant if its
a.   t-statistic is greater than 2.
b.   p-value is greater than 2.
c.   standard error is less than 0.05.
d. R^2 value is greater than 0.9.

(6) On a graph with consumption on the vertical axis and leisure hours on the horizontal axis, a worker's indifference curve connects combinations or bundles that
a.   have the same marginal rate of substitution.
b.   yield the same total income.
c.   cost the same amount.
d.   are equally preferred.

(7) 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.
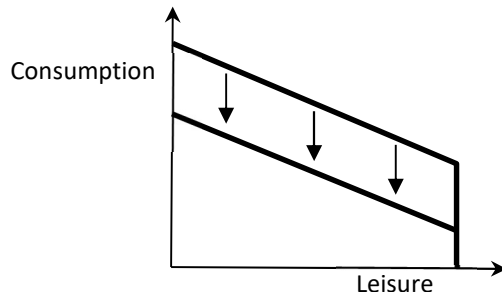
(8) Worker X desires to work fewer hours in response to an increase in the hourly wage. For Worker X, the substitution effect of the wage increase is
a.   greater than the income effect.
b.   less than the income effect.
c.   exactly equal to the income effect.
d.   cannot be determined from the information given.

(9) The modern economic theory of fertility attributes falling fertility rates to
a.   increased selfishness of potential parents.
b.   increases in income.
c.   increases in the "price" or cost of raising children.
d.   rising worker productivity.

(10) A profit-maximizing firm in a competitive labor market will
a.   adjust its employment level until the wage equals value of marginal product.
b.   adjust other inputs until the wage equals value of marginal product.
c.   adjust its wage until the wage equals value of marginal product.

(11) When all firms in an industry suffer a wage increase, they each decrease their labor input less than they would if only one firm suffered the same wage increase because
a.   the production function shifts up.
b.   workers are easier to find.
c.   the output price rises.
d.   the capital stock expands.

(12) Labor demand is less elastic in the short run than in the long run because
a.   labor is a normal good.
b.   firms cannot substitute capital for labor in the short run.
c.   firms pay less attention to short-run profit than to long-run profit.
d.   isocost curves become steeper as the wage increases.

(13) According to the Hicks-Marshall rules, labor demand by an industry 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.

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. Work carefully—partial credit is not normally given in this section.

(1) [Elasticity of labor demand: 8 pts] Suppose the elasticity of demand for supermarket workers in Des Moines has an elasticity of -0.6. Now suppose an increase in the minimum wage raises these workers' wage by 10 percent, but the demand curve does not shift.

  a. Will the number of jobs for supermarket workers *increase* or *decrease*?

  b. By about how much?   %

  c. Will the total income of supermarket workers (or their wage bill) *increase*
     or *decrease*?
  d. By about how much?   %

(2) [Budget constraint: 6 pts] Suppose Ana 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 Ana works more than 40 hours per week, she is paid "time and a half" for those extra hours. This means her wage on the first 40 hours she works is $10, but her wage on subsequent hours is $15 per hour. *Using a straightedge,* draw a graph of Ana's weekly budget constraint. Label the endowment point and any other kink points.
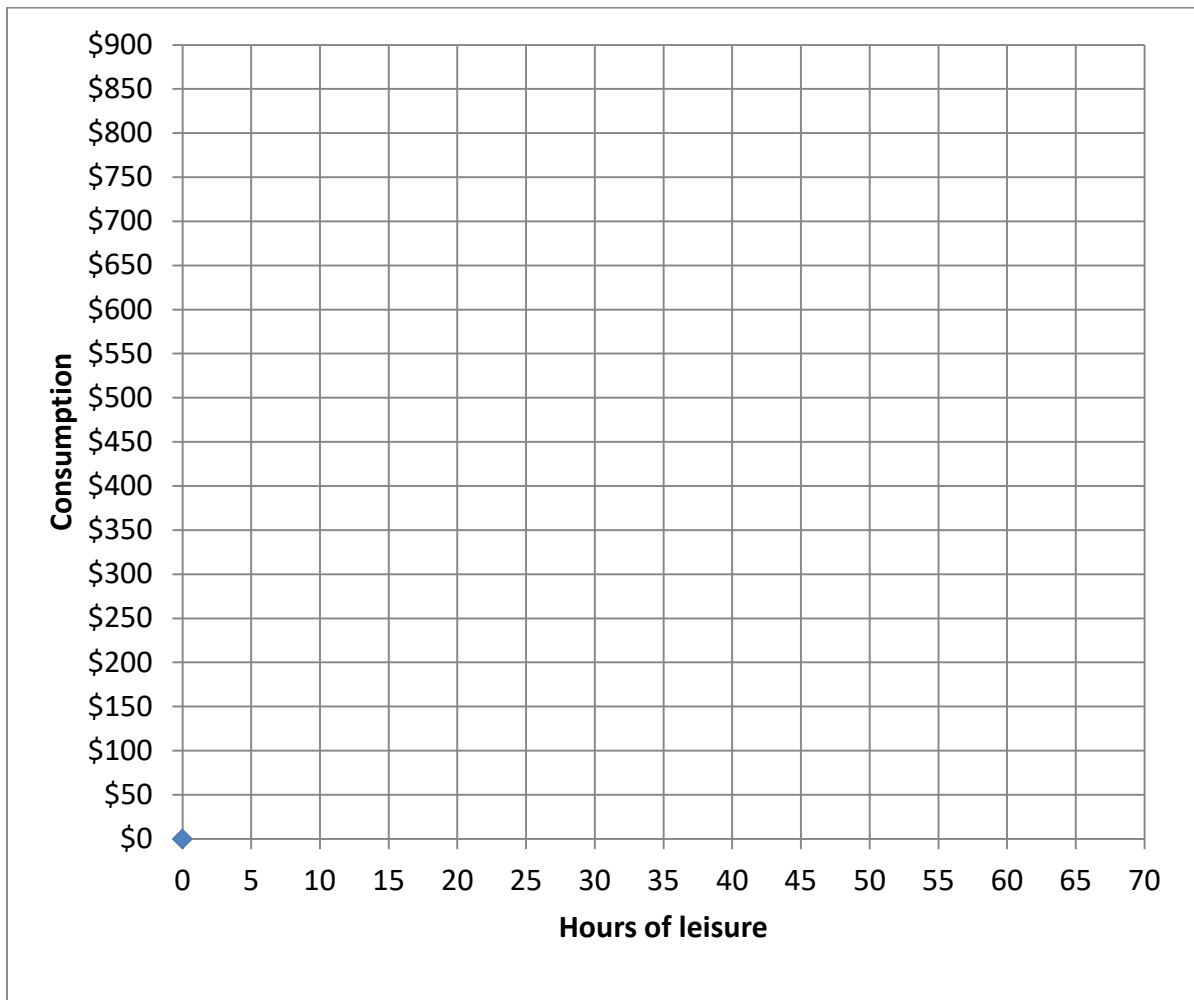
(3) [Individual labor supply—optimal choice: 12 pts] Let L denote the days of leisure Amy enjoys per month and let C denote her dollars of consumption. Suppose Amy's utility function is $U = C(L-10)$. A little calculus shows that her marginal utility of consumption is $MU_C = L-10$ and her marginal utility of leisure is $MU_L = C$. She has $200 in monthly nonlabor income and 30 days per month available for work or leisure.

a. [2 pts] Give a formula in terms of C and L for Amy's marginal rate of substitution of leisure for consumption (MRS).

b. Compute Amy's reservation wage per day.

Suppose Amy can work as many days as she likes at a wage of $100 per day.

c. Give an equation for her monthly budget constraint in terms of L and C.

d. How much leisure L and consumption C will she choose to enjoy per month?

e. [1 pt] How many days will she choose to work per month?

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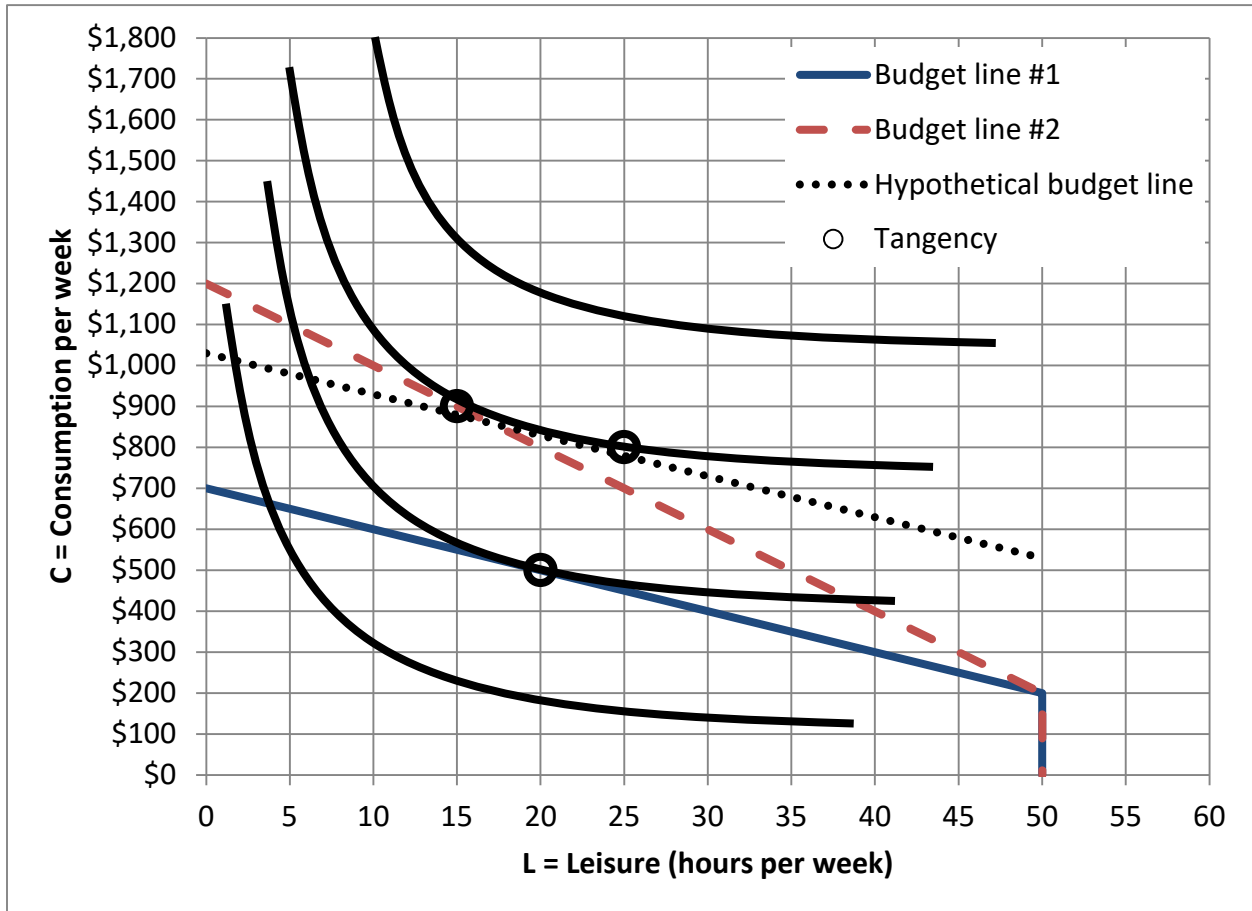
a. According to this graph, what is Alison's total available time for work or leisure?

	hours

b. How much nonlabor income does Alison enjoy?

$	

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

$	per hour

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

$	per hour

Consider Alison'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 Alison 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 Alison 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 Alison 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

Question continues on next page.

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

Labor supply curve
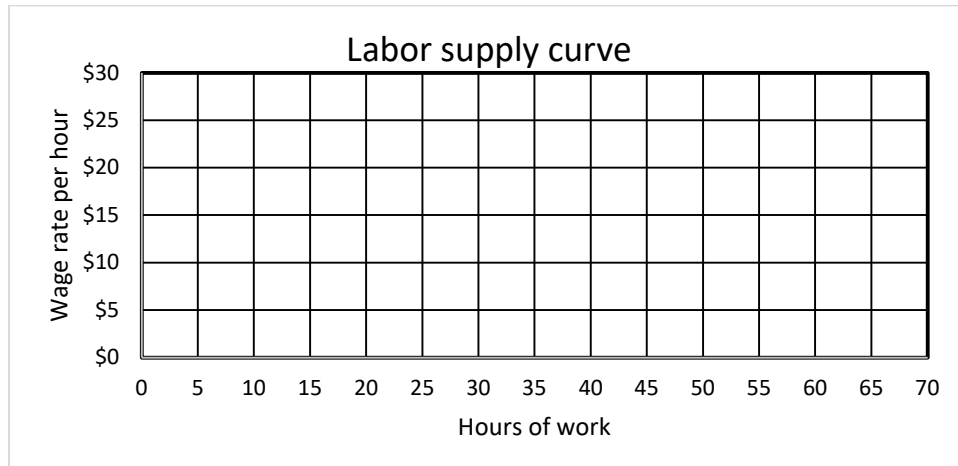
(5) [Household specialization: 10 pts] Party A can earn $20 per hour in the labor market and can produce 5 units of household services per hour. Party B can earn $20 per hour and can produce 20 units of household services per hour. Each party has 10 hours per day available for paid work or household production.
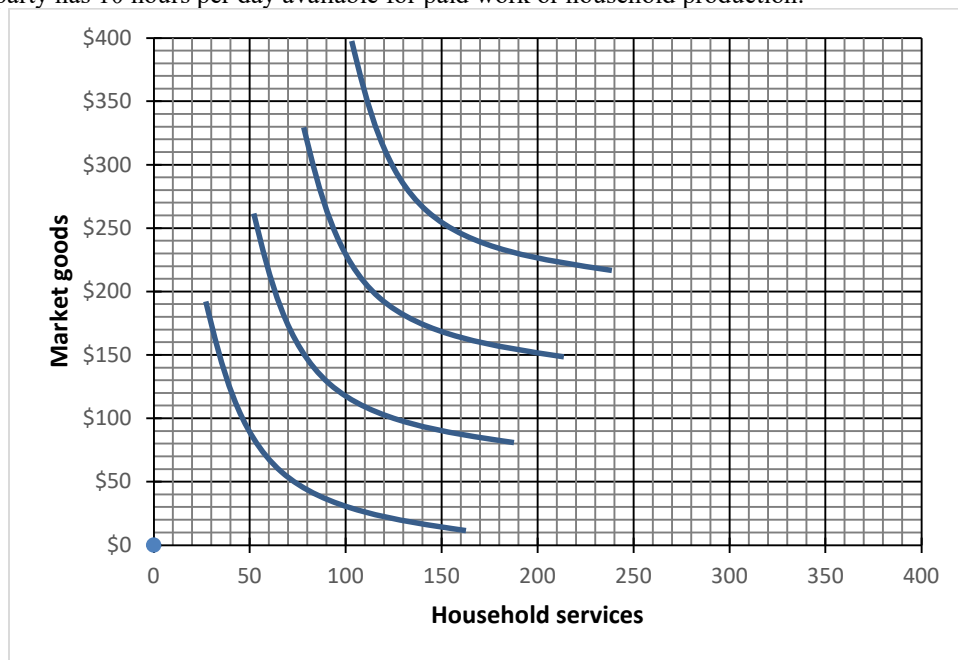
Suppose Party A and Party B form a household. The graph above shows the household's indifference curves.

a. [6 pts] Draw the household's joint production-possibility curve in the graph above. Circle any kink points.

b. [2 pts] How many hours per day will Party A work in the labor market? | hours

c. [2 pts] How many hours per day will Party B work in the labor market? | hours

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

$$q = 10 \ (K \ E)^{1/2} \ .$$

A little calculus shows that the marginal product of labor is

$$MP_E = (5) \ (K/E)^{1/2} \ .$$

The price of output is $10, the wage is $20 per hour, and the price of capital is $50. The capital stock is fixed at K=16 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] Bulldog Manufacturing Company uses labor and capital to make windshield scrapers. The graph below shows Bulldog's isoquants, two true isocost lines, and one hypothetical isocost line parallel to isocost line #2.
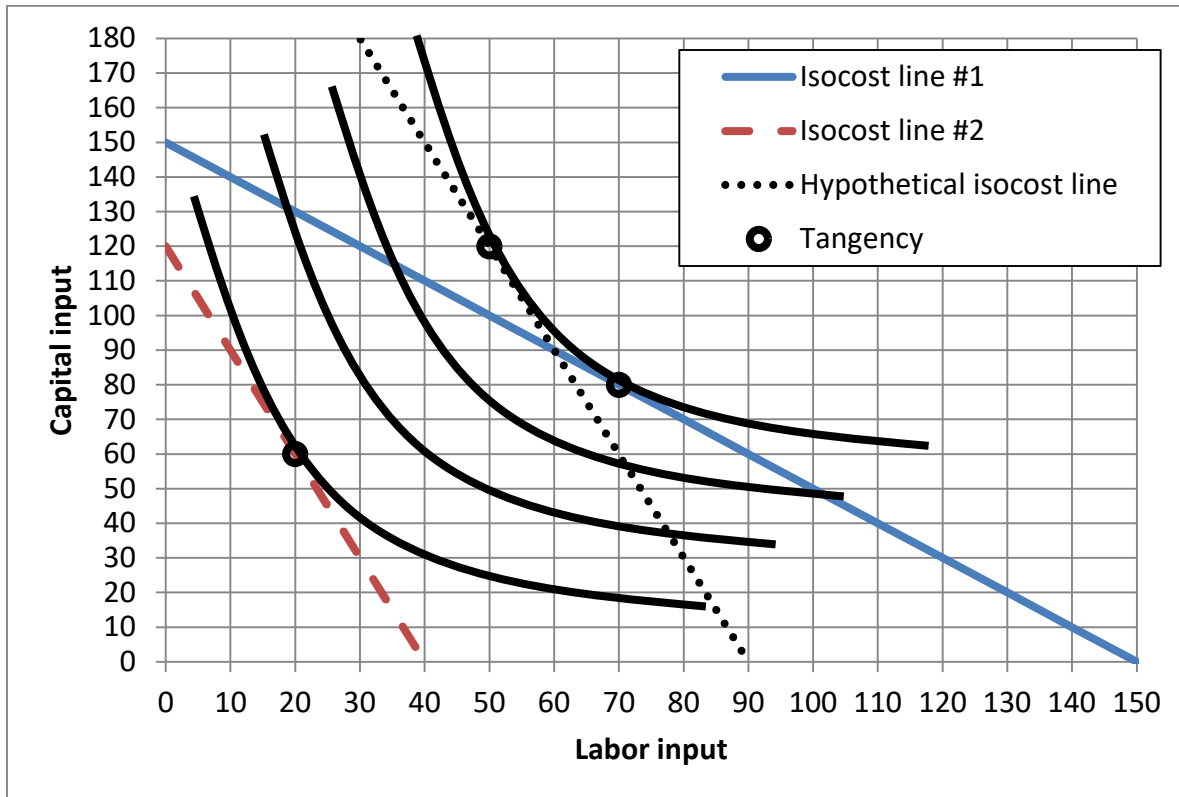
The price of capital used by Bulldog is always $10. However, the wage (the price of labor) changes.

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

Consider the effects of this change in the wage on Bulldog's use of labor input.
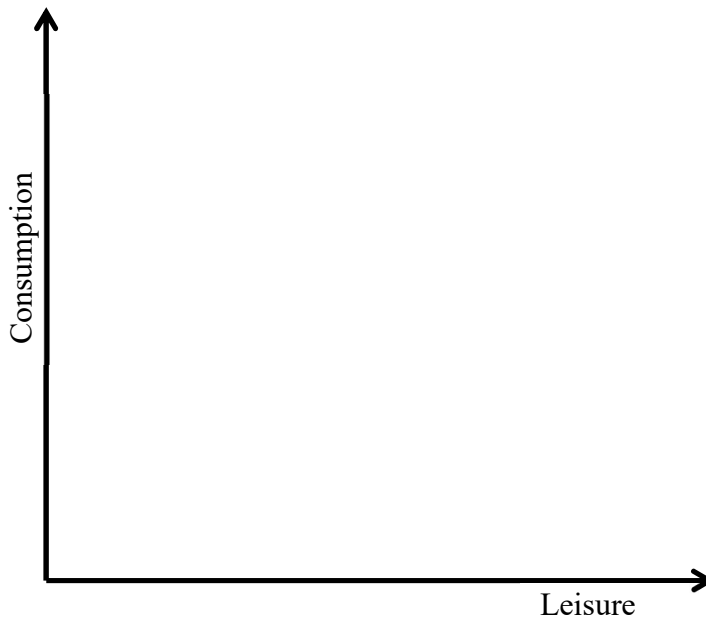
c. Does the substitution effect cause Bulldog to use *more* labor or *less* labor input?

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 Bulldog 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 Bulldog 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

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

(1) Suppose a "universal basic income" program gave $1000 per month to everyone. Would workers receiving this payment increase or decrease their hours of work, according to economic theory? Why? Illustrate your answer with a diagram showing two budget lines and several indifference curves.

(2) Suppose a wage subsidy doubled the wage of certain workers. Would workers receiving this payment increase or decrease their hours of work, according to economic theory? Why? Illustrate your answer with a diagram showing two budget lines and several indifference curves.

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]