Instructions

The questions below are arranged into three groups (group A, group B, and group C). You must answer at least one question from each group and the combination of questions must sum to exactly 150 points.

Group A contains two 25-point questions and one 50-point question from Test 1.
Group B contains two 25-point questions and one 50-point question from Test 2.
Group C contains three 50-point questions from student presentations.

Group A: Questions from Test 1
25 point questions

1. Analyze the impact of a government program that subsidizes the wages of all women in the population by paying their employers 50 cents for every hour they work. Your answer should graph the situation and explain your conclusions.
   a. What would be the effect on the wage rate women received? (10 points)
   b. What would be the effect on the net wage employers paid? (10 points)
   c. What would be the effect on men’s wages? (5 points)

   Answer:
   a. THIS WOULD INCREASE THE DEMAND FOR WOMEN; CREATING A SHORTAGE OF FEMALE LABOR. THUS THE WAGE WOMEN RECEIVE WILL BE BID UP, INCREASING QUANTITY SUPPLIED BY WOMEN TO A NEW EQUILIBRIUM AT W₁, L₁.

   b. FIRMS WILL INCUR A COST PER HOUR OF FEMALE LABOR OF THE NEW WAGE W₁ MINUS THE SUBSIDY OF 50 CENTS. THIS IS BELOW THE OLD WAGE OF W₀.

   c. SINCE THE SUBSIDY MAKES THE EMPLOYMENT OF WOMEN MORE DESIRABLE THAN BEFORE THE SUBSIDY, IF MEN AND WOMEN ARE GROSS SUBSTITUTES (VERY LIKELY) THE DEMAND FOR MEN WILL DECREASE. IF THEY ARE GROSS COMPLEMENTS, THE DEMAND FOR MEN WILL INCREASE.
2. Consider two business tax options. **Option 1** places a tax of 5 cents on each labor hour employed. That is a firm that employ 100 workers for 40 hours each would be taxed $200 per week (4000 labor hours times $0.05 per hour). **Option 2** taxes each firm's total revenue two-tenths of one percent (0.002). So a firm that has total sales of $100,000 per week would be taxed $200 per week ($100,000 times 0.002).
   a. Define “scale effect” and “substitution effect”. (10 points)
   b. Explain any employment differences between these options, using the concepts of scale and substitution effects. (10 points)
   c. Identify which (if any) option would have the larger impact on employment. (5 points)

**Answer:**
   a. THE “SCALE EFFECT” IS THE CHANGE IN DEMAND ASSOCIATED WITH CHANGE IN THE PROFIT-MAXIMIZING OUTPUT LEVEL. THE “SUBSTITUTION EFFECT” IS THE CHANGE IN DEMAND ASSOCIATED WITH THE CHANGE IN THE RELATIVE COST (WAGE) OF INPUTS.
   b. OPTION 1 INCREASES THE RELATIVE COST OF LABOR. IT WILL HAVE BOTH A SUBSTITUTION AND SCALE EFFECT. OPTION 2 INCREASES THE TOTAL COST, BUT NOT THE RELATIVE COST OF INPUTS. THUS IT HAS ONLY A SCALE EFFECT.
   c. OPTION 1 WILL HAVE THE GREATER NEGATIVE IMPACT ON EMPLOYMENT BECAUSE BOTH THE SUBSTITUTION AND SCALE EFFECTS WILL REDUCE EMPLOYMENT.

50 point question from Test 1
3. “Rings and Things” manufactures decorative rings. The production function for rings is: $Q = 20 KL$, where $K$ is the number of hours of equipment used and $L$ is the number of hours of labor used. Workers earn $8 per hour and equipment rents for $8 per hour.
   a. Determine the cost-minimizing capital-labor ratio for this firm. (10 points)
   b. What does it cost this firm to produce 12,500 rings? (10 points)
   c. Suppose the rental cost of equipment increases to $10 per hour. What is the new cost minimizing capital-labor ratio? (15 points)
   d. If the increased cost reduces sales from 12,500 rings to 11,000, will the substitution or scale effect dominate? That is will the cost-minimizing labor usage increase or decrease? Explain. (15 points)

**Answer:**
   a. COST MINIMIZING CAPITAL-LABOR RATIO REQUIRES $\frac{MP_L}{MP_K} = \frac{w}{r}$; $MP_L = 20K$; $MP_K = 20L$; $20K/20L = \frac{8}{8} = K/L = 1$
   b. $Q = 12,500 = 20 KL = 20 K^2$; $625 = K^2$; $K = 25$; $L = 25$. Cost = $25r + 25w = $400
c. COST MINIMIZING CAPITAL-LABOR RATIO REQUIRES \( \frac{MPL}{MPK} = \frac{w}{r} \);
\[ MPL = 20K; \ MPK = 20L; \ 20K/20L = \frac{8}{10} = K/L = 0.8 \]

d. 11,000 = 20 KL = 20L (0.8 L) = 16 L^2; 687.5 = L^2; L ~ 26; K = 0.8 (L) ~ 21.
SINCE LABOR USAGE INCREASES, THE SCALE EFFECT < SUBSTITUTION.

Group B: Questions from Test 2
25 point questions
4. Suppose you win the lottery which provides you with an after-tax annual payment of $50,000. As a result, you decide to reduce your work from 40 hours per week to 30 hours per week, but continue to work 50 weeks per year.

   a. The substitution effect is \( \frac{\Delta H}{\Delta W} \) holding income constant. Calculate the substitution effect associated with winning this lottery. (10 points)
   
   b. The income effect is \( \frac{\Delta H}{\Delta I} \) holding the wage constant. Calculate the income effect associated with winning this lottery. (10 points)
   
   c. Explain or interpret the total results. I am looking for a numerical estimate. (5 points)

ANSWER:

a) (10 points) THE SUBSTITUTION EFFECT IS ZERO. THE LOTTERY DOES NOT CHANGE THE WAGE, IT INCREASES WEALTH (INCOME) INDEPENDENT OF HOURS OF WORK.

b) (10 points) THE INCOME EFFECT = -1/100. FOR EVERY $100 INCREASE IN ANNUAL NONLABOR INCOME, YOU REDUCE YOUR HOURS WORKED BY 1 HOUR EACH YEAR.

c. (5 points) THE CHANGE IN ANNUAL HOURS IS 10 HOURS PER WEEK FOR 50 WEEKS; THUS A REDUCTION BY 500 HOURS. THE CHANGE IN INCOME IS $50,000; THUS THE INCOME EFFECT IS -500/50000 = -1/100.

5. During recessions we often observe that some workers lose their jobs and drop out of the labor force, while other workers enter the labor force. These phenomena are usually labeled the “discouraged-worker” effect and the “added-worker” effect, respectively. Base your explanation on the theory developed in chapter 7 of the text (household supply of labor and assume the partners are substitutes in household production).

   a. Explain why during a recession one member of a family who had provided market work might drop out of the labor force. (10 points)
   
   b. Explain why during a recession another member of the family who had NOT provided market work might enter the labor force. (10 points)
   
   c. Draw a graph of the household’s budget constraints before and after the recession. (5 points)
**ANSWER:**
a. **“DISCOURAGED-WORKER” EFFECT:** IF ONE MEMBER WHO IS CURRENTLY IN THE LF LOSES HER JOB AND HER EXPECTED MARKET WAGE FALLS BELOW HER RESERVATION WAGE, IT MAY BE OPTIMAL FOR THE HOUSEHOLD TO HAVE HER FOCUS ON HOUSEHOLD PRODUCTION.

b. **“ADDED-WORKER” EFFECT:** IF THE MARKET INCOME OF THE PARTNER FALLS BECAUSE OF THE RECESSION, THE OTHER MEMBER OF THE HOUSEHOLD MAY FIND IT ADVANTAGEOUS LOOK FOR MARKET WORK. THE COMPARATIVE ADVANTAGE SWITCHES FROM ONE MEMBER TO THE OTHER.

c. FOR SIMPLICITY, ASSUME CHRIS LOSES HER JOB AND JACKIE IS THE OTHER MEMBER OF THE HOUSEHOLD. THE WAGE CHRIS CAN EXPECT TO EARN FALLS (WAGE OF NEW JOB TIMES PROBABILITY OF FINDING A NEW JOB). THIS WILL CAUSE THE RATIO OF HER MARKET PRODUCTIVITY TO HOUSEHOLD PRODUCTIVITY (MPm/MPhh) TO FALL. IF CHRIS’S RATIO FALLS BELOW JACKIE’S, IT WILL BE BEST FOR THE HOUSEHOLD FOR JACKIE TO SEEK MARKET WORK.

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50 point question from Test 2

6. Consider a program that would pay half of the child care expenses of low-income parents who work at least 15 hours per week. What impact would economic theory Use economic theory to analyze the impact of this program to substantially expand the
childcare subsidies of low-income parents who work on earnings inequality (as measured by the 90-10 ratio) in the United States.

a. What impact will this program have on labor force participation of low-income households and how will this impact earning inequality? (20 points)
b. What impact will this program have on hours of work provided by low-income households and how will this impact earning inequality? (20 points)
c. Would the choice of the Gini coefficient rather than the 90-10 ratio to measure inequality influence your conclusions above? (10 points)

ANSWER:

a. (20 points) REDUCING CHILD CARE SUBSIDIES WILL TEND TO REDUCE THE RESERVATION WAGES OF PARENTS WHO ARE NOT IN THE LABOR FORCE, AND SHOULD ENCOURAGE THEM TO ENTER THE LABOR FORCE AND SEEK JOBS AT LOWER PAY THAN THEY WOULD HAVE ACCEPTED BEFORE THE SUBSIDY. BY EXPANDING THE NUMBERS OF LOW-WAGE WORKERS, THUS THE SUBSIDIES ARE LIKELY TO INCREASE MEASURED EARNINGS INEQUALITYITY (INCOME INEQUALITY, HOWEVER, MAY FALL).

b. (20 points) LOW-INCOME PARENTS WHO ARE ALREADY WORKING MAY RESPOND TO THE SUBSIDY BY CHANGING THEIR HOURS OF WORK. THE SUBSIDY INCREASES THEIR TAKE-HOME WAGES. THUS THERE WILL BE A SUBSTITUTION EFFECT PUSHING TOWARD MORE HOURS OF WORK (AND THUS HIGHER EARNINGS); THUS THE SUBSIDIES ARE LIKELY TO INCREASE EARNINGS OF LOW-INCOME HOUSEHOLDS AND DECREASE MEASURED EARNINGS INEQUALITY. HOWEVER, THERE WILL BE AN INCOME EFFECT THAT PUSHES TOWARD FEWER HOURS OF WORK (AND THUS LOWER EARNINGS). WHICH WOULD TEND TO INCREASE MEASURED EARNINGS INEQUALITY.

c. (10 points) THE EFFECT ON MEASURED INEQUALITY WILL DEPEND ON THE MEASURE OF INEQUALITY ADOPTED. IF THE MEASURE IS THE 90–10 RATIO, THE ADDITION OF LOW-WAGE WORKERS TO THE WORKFORCE MAY WELL CAUSE THE RATIO TO RISE. THIS IS LESS LIKELY IF THE GINI COEFFICIENT IS USED.

Group C: Questions on student presentations
50 point questions

7. Three student presentations discussed issues employee compensation. Nathan Ash focused on piece rates and John discussed the compensation of CEOs and Sylvia explored the relationship between firm characteristics and wages.

Each of these issues can be framed in model of a pay scheme that recognizes the need to 1) attract a sufficient number of employees (get workers to participate) and 2) provide
incentive to extract the optimal level of effort from employees. The participation constraint is often met using a base wage or salary. The performance rewards are often used to provide the effort incentive.

In class we ignored the second issue by assuming each unit of labor provided their optimum level of effort (the marginal product did not depend on the effort of the worker).

a. Explain the requirements of a pay scheme (job offer) necessary to attract a worker, using the simple model of labor supply. (20 points)

b. Recognize that increasing effort requires workers incur increasing costs. Assume that the pay scheme is sufficient to attract the worker. How will the worker determine the optimal effort level given the performance reward offered by the firm? (20 points)

c. Choose one of the three presentation topics (other than your own) in terms of a performance based pay scheme. Clearly explain how you would reframe the issue discussed in the chosen presentation using the model. That is, what part of the compensation is used to meet the participation constraint and what part is used to provide the performance reward? (10 points)

ANSWER:

a. THE SIMPLE MODEL OF INDIVIDUAL LABOR SUPPLY INDICATES THAT A WORKER WILL PARTICIPATE IN THE LABOR MARKET (SUPPLY HOURS OF WORK) IF THE MARGINAL BENEFIT OF DOING SO (THE HOURLY WAGE) IS GREATER THAN THE RESERVATION WAGE (VALUE PLACED ON LEISURE TIME).

b. THE WORKER WILL CONTINUE TO INCREASE EFFORT AS LONG AS THE MARGINAL BENEFIT (THE PERFORMANCE REWARD) IS GREATER THAN THE MARGINAL COST OF EFFORT.

c. MUST REFRAME ISSUE IN TERMS OF SALARY AND PERFORMANCE.

8. Three student presentations discussed the impact of technological change on the demand for labor. Topher provided a broad perspective, while Mike focused on “green” technologies and Nathan Grace on “process innovation” and energy technology.

The class discussion of technology focused mostly on long-run optimal levels between labor and capital. Important concepts included the relationship between labor and capital, whether they are complements or substitutes; and relative size of the substitution and scale effects. For these questions, assume there are two types of capital (legacy and green) and two types of labor.

a. Describe a model discussed in class which would be applicable to the analysis of the effect technological change on employment. Be sure to include the optimal condition each firm will face. (20 points)
b. Identify two specific types of labor of your choosing that will be affected differently from a substantial increase in the cost of legacy technology. (10 points)

c. Explain the impact of a substantial increase in the cost of legacy technology on each type of labor. (20 points)

**ANSWER:**

a. **THE MARGINAL PRODUCT THEORY OF THE DEMAND FOR LABOR INDICATES THAT A FIRM MAXIMIZES PROFIT WHEN THE MRP OF LABOR IS EQUAL TO ITS MARGINAL EXPENSE. IN THE LONG RUN WITH TWO TYPES OF CAPITAL AND TWO TYPES OF LABOR THE OPTIMAL MIX OF INPUTS FOR THE FIRM IS THE MARGINAL PRODUCT PER MARGINAL EXPENSE OF EACH INPUT BE EQUAL.**

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\frac{MP_{L1}}{ME_{L1}} = \frac{MP_{L2}}{ME_{L2}} = \frac{MP_{K1}}{ME_{K1}} = \frac{MP_{K2}}{ME_{K2}}
\]

b. **THE WORKER WILL CONTINUE TO INCREASE EFFORT AS LONG AS THE MARGINAL BENEFIT (THE PERFORMANCE REWARD) IS GREATER THAN THE MARGINAL COST OF EFFORT.**

c. **MUST REFRAME ISSUE IN TERMS OF SALARY AND PERFORMANCE.**

9. Answer the following questions for a student presentation (other than your own).

a. Identify the student and the topic, and then clearly summarize the issue addressed as concisely as you can. (10 points)

b. Reframe the issue in terms of a model discussed in class. This requires:

i. General summary of the theory (20 points);

ii. Apply the theory to the issue and identify important conclusions of the model (20 points).

**ANSWER:**