Homework 2

ECON 380
UNC Chapel Hill

Name: _____

ONYEN: _____

Due date: **September 27** by **2:25PM**. You must turn in your work on a printed copy of this document in order for it to be graded. Your assignment must be stapled and in the correct order. Non-stapled assignments or those not on a copy of this document will automatically receive a 10 point deduction.

Neoclassical Model of Labor Supply

1. Mary is a waitress at a local coffee shop. The current wage rate is \$10 an hour. Per week, she has 110 hours to allocate between consumption and leisure. Additionally, she receives a check for \$150 dollars per week in non-labor income from her number one fan, Charlie. Finally, Mary's utility function is given by $U(C, L) = C^{1/3}L^{2/3}$. Thus,

$$MU_L = \frac{2C^{1/3}}{3L^{1/3}}$$

$$MU_C = \frac{L^{2/3}}{3C^{2/3}}$$

   (a) Write the equation for Mary's budget line. **[2 pts]**

   (b) Write the equation for Mary's $MRS_{L,C}$, simplifying as much as possible. **[2 pts]**

(c) What is Mary's optimal bundle of consumption and leisure? **[3 pts]**

Now, suppose Mary's wage rate rises to \$12 an hour.

(d) What is Mary's new optimal bundle of consumption and leisure? **[3 pts]**

(e) What does your answer in (d) tell you about the relationship between the income and substitution effects (i.e., which on is larger)? **[2 pts]**

(f) What is Mary's estimated labor supply elasticity given this wage change? What does the value tell you about Mary's responsiveness to this change in wages? **[3 pts]**

2. Artemis earns \$25 per hour as an actress. In addition to her labor market income, she receives \$100 per day in lottery winnings. She allocates her 24 hours each day between work and leisure, and spends all of her income on consumption.

   (a) What is the equation for Artemis' budget constraint? **[2 pts]**

(b) Draw her budget constraint in the graph below. Label it B^0. **[2 pts]**

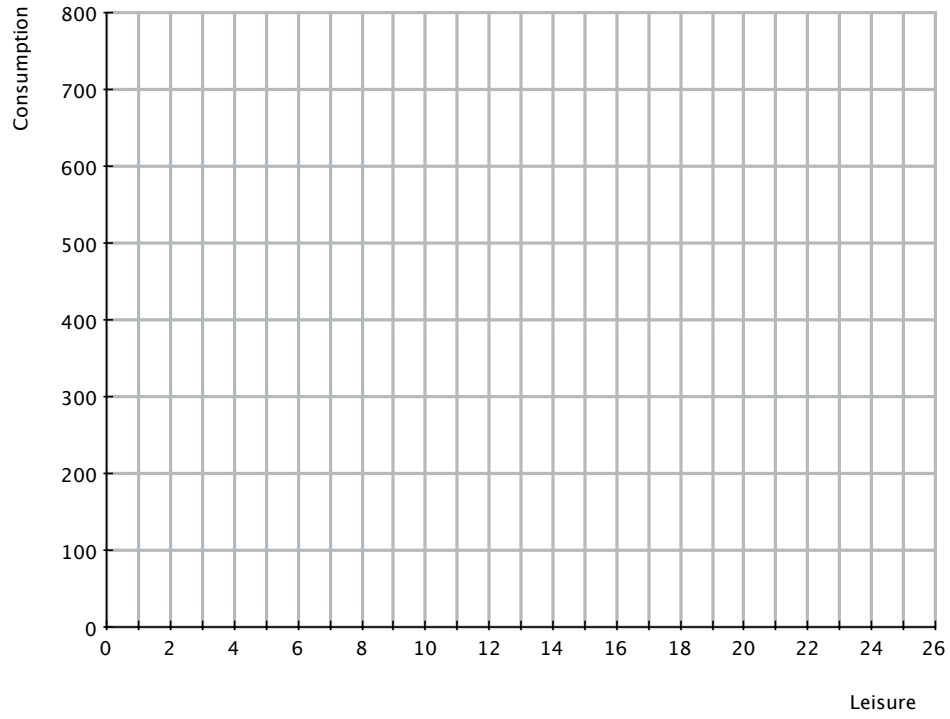

Figure 2: Artemis' Budget Set

Suppose the government imposes a subsidy program similar to the earned income tax credit. For the first 8 hours Artemis works, she receives a 50% wage subsidy (i.e., her net wage is 1.5 times her gross wage for these hours). For the next 8 hours, the government gives no wage subsidy, and instead makes individuals pay a wage tax of 50%. Wages earned after 16 hours of work are neither taxed nor subsidized. For example, if Artemis works 18 hours, her net earnings would be $8 \times (\$25 \cdot 1.5) + 8 \times (\$25 \cdot .50) + 2 \times (\$25 \cdot 1) = \$450$.

(c) What is the (absolute) slope of her new budget set when $16 \leq L \leq 24$? **[2 pts]**

(d) What is the (absolute) slope of her new budget set when $8 \leq L < 16$? **[2 pts]**

(e) What is the (absolute) slope of her new budget set when $0 \leq L < 8$? **[2 pts]**

(f) On the same graph as (b), draw her budget set after the enactment of this policy. Label it B^1. **[2 pts]**

(g) Suppose that Artemis' preferences are convex, monotone, complete, and transitive. Further, suppose that her reservation wage is \$30. Using indifference curves, show that she will work 0 hours before the policy is enacted, but work positive (>0) hours after the policy is enacted. Draw the indifference curves on your earlier graph, but give your explanation here. **[2 pts]**

3. Many states offer child-care grants for low-income single mothers (e.g. New York), as opposed to (or in addition to) standard cash grants. The primary purpose of this type of policy is to invoke single mothers, who likely need to be compensated with a high wage to offset childcare costs, into the labor force. First, consider the daily labor supply decision of Sarah, who has preferences dictated by $U(C, L) = 2C^{2/3}L^{1/3}$, faces a wage rate of $w = \$8$ and earns non-labor income of $V = \$200$.

   (a) Sarah's marginal rate of substitution is given by $MRS_{L,C} = C/2L$. Compute her reservation wage. Will she work at the market wage rate? **[2 pts]**

   (b) What is Sarah's optimal bundle of leisure hours and consumption dollars? **[3 pts]**

Now, consider Sarah's twin sister Tara, who has a child. Like Sarah, Tara has non-labor income of V=\$200, a wage rate of $w = \$8$, and preferences represented by $U(C, L) = 2C^{2/3}L^{1/3}$. However, Tara faces a "fixed cost" to participating in the labor force. If she does not participate (choosing $h = 0$), she does not have to pay for childcare. If she chooses to participate and work $h > 0$ hours, she must pay $P_C = \$100$ each day for childcare.

   (c) What is her non-labor income if she does not participate in the labor force? What is her effective non-labor income if she does participate in the work force and has to pay for child care? **[2 pts]**

(d) On the graph below, plot Tara's budget constraint, and label it B^0. (Hint: Think carefully about how much consumption income she has, less her childcare costs, at 0 labor hours, 1 labor hour, 0.01 labor hours, etc.). **[2 pts]**

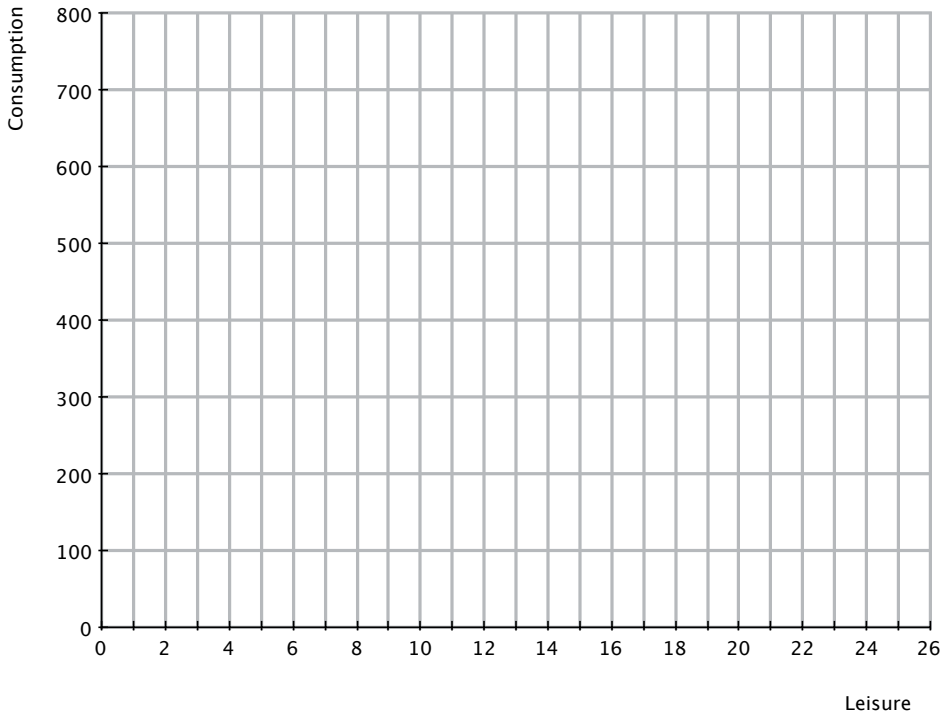

Figure 4: Tara's' Budget Set

(e) Using indifference curves (you don't need to use her preferences, just general, convex indifference curves), illustrate why Tara would likely prefer to stay out of the work force, as opposed to entering the work force and incurring the childcare costs. **[2 pts]**

(f) Now, suppose the government offers a \$100 childcare payment to Tara which she receives if, and only if, she works $h > 0$ hours. Plot her new budget constraint, and label this constraint B^1. Briefly explain how this effectively gives her the same labor force incentives as Sarah; in other words, explain why this would lead her to return to the labor force. **[2 pts]**

4. **Directions**: Type your response to this question and attach it to the back of this packet. **[10 pts]** Non-typed answers will receive zero points.

   Read the introduction and section II of *Labor Supply Response to the Earned Income Tax Credit (1996)* by Eissa & Liebman found on Sakai. In 8-10 sentences, summarize

   (i) the predicted impact of the EITC on labor force participation

   (ii) the predicted impact of the EITC on work hours in each phase of the subsidy

   (iii) the authors' strategy to identify the effects of the EITC on labor supply

   (iv) the authors' main findings

Short-Run Labor Demand

5. Paddy's Pub produces hand-crafted wooden chairs in the perfectly competitive market for hand-crafted wooden chairs using woodshops (S) at rental rate \$200 and labor (E) at wage rate \$10 according to the production function $f(S, E) = 5S^{3/4}E^{1/4}$. Suppose that Paddy's Pub currently has four woodshops, and the market price of a hand-crafted wooden chair is \$125. The markets for labor and woodshops are also competitive. Note: When necessary, round to two decimals.

   (a) What is the (approximate) marginal product of the 10^{th} unit of labor? Explain the meaning of this number. **[2 pts]**

   (b) What is the (approximate) value of the marginal product of the 10^{th} unit of labor? Explain the meaning of this number. **[2 pts]**

   (c) How many hours of labor should Paddy's Pub employ in the short-run to maximize profits? The equation for the marginal product of labor is given by $MP_E = \frac{5}{4}(\frac{S}{E})^{3/4}$. Label this number E_0^*. (Note: In this example, the number of woodshops is fixed in the short-run). **[4 pts]**

(d) Now suppose that the wage rate rises to \$12. Assuming we're still in the short-run, how many hours of labor should Paddy's Pub employ at the new higher wage rate? Label this number E_1^*. **[2 pts]**

(e) From your calculations in (c) and (d), compute the company's short-run elasticity of labor demand. If necessary, round to two decimals. **[2 pts]**

(f) In 2-3 sentences, explain why labor demand is more elastic in the long-run. **[2 pts]**

Long-Run Labor Demand

6. Cricket produces dog food using labor and ovens, but he's not particularly good at allocating his resources. Suppose the price of labor (E) is $w = \$10$ and the price of ovens (O) is $r = \$30$.

   (a) Suppose that initially Cricket is employing both labor and ovens, and at his current bundle of inputs, the marginal rate of technical substitution is given by $MRTS_{E,O} = \frac{MP_E}{MP_O} = 1/2$. Explain how he could reallocate his resources to increase his profits. **[2 pts]**

(b) Now, suppose that Cricket is still employing both labor and ovens, but at this new bundle of inputs, the marginal rate of technical substitution if given by $MRTS_{E,O} = \frac{MP_E}{MP_O} = 1/10$. Explain how, once again, he could reallocate his resources on increase his profits. **[2 pts]**

FOR GRADING:

Question:	1	2	3	4	5	6	Total
Points:	15	14	13	10	14	4	70
Score:							