ECON481
Assignment One
Due: February 5th

Name: ---------- **Student ID ----------**

- **The deadline is February 5th in class. You may submit your assignment earlier. In this case, leave it in my mailbox in the economics department.**
- **In all graphing questions, put leisure (L) on the horizontal axis and consumption (C) on the vertical axis. L is in units of time and consumption is in dollars. Also, the indifference curves are well-behaved.**

Multiple Choice (10 Marks)

1. Suppose a worker is observed to be working but is forced to work fewer hours than she really wants to work. Which of the following statements is true?
   A) The indifference curve that she is on is tangent to the budget line.
   B) She is on an indifference curve that is lower than the one that is tangent to the budget line.
   C) She is on an indifference curve that is higher than the one that is tangent to the budget line.
   D) She is on an indifference curve which is lower than the one which passes through the point on the budget line corresponding to zero hours of work.

2. The wage rate at which the individual worker is indifferent between participating and not participating in the labour force is called the:
   A) Minimum wage
   B) Reservation wage
   C) Utility wage
   D) Participating wage

3. Consider the situation of a worker who is 'at the corner equilibrium' i.e., he or she is supplying zero hours of work and consuming 16 hours of leisure. In context of the income-leisure framework, which of the following statements is false?
   A) The indifference curve is flatter than the budget line.
   B) The marginal rate of substitution is greater than the wage rate in absolute value terms.
   C) The rate at which the worker is willing to exchange income for leisure is not equal to the market rate for the exchange of income for leisure.
   D) Marginally, the worker values an hour of leisure more than she values an hour's worth of income.

4. Over the backward bending portion of the labour supply curve,
   A) The substitution effect of a wage change dominates the income effect.
   B) Leisure becomes an inferior good.
   C) There is no longer a trade-off between income and leisure.
   D) The wage elasticity of labour supply is negative.

5. Which of the following statements is correct: If an individual has a …
   A) Lower valuation of leisure, then the marginal rate of substitution of consumption over leisure is higher.
   B) Higher valuation of consumption, then the marginal rate of substitution of consumption over leisure is higher.
   C) Higher valuation of leisure, then the slope of the budget constraint is steeper.
   D) Higher valuation of consumption, then the slope of his indifference curve is flatter.

Problem One (40 Marks)

Assume Zoë's utility function is $U(C, L) = C * L$ where C is consumption measured by her total income and L is leisure. Total income is labour income and non-labour income. She has $y = \$400$ non-labour income and a total of 150 hours to allocate between work (consumption) and leisure at the market wage rate of $w = \$10$ per hour.

a) Write down the budget constraint and the slope of the budget constraint. (2 marks)
b) Solve the optimal desired hours of leisure (L) and work (h). (2 marks)
c) Calculate the quantity of utility. (1 mark)
d) Draw Zoë's budget constraint and indifference curve. Label the horizontal and vertical intercepts and optimal leisure and consumption quantities. (2 marks)

Suppose a company makes a job offer to Zoë. However, this company needs to design a system that motivates her to work more hours. The following two scenarios are suggested.

Scenario I) Straight-time equivalent (17 marks)
Suppose the company increases the hourly wage to $w = \$16$ per hour.

e) Solve the new optimal leisure-work choice (L and h). (2 marks)
f) Draw a new graph and show the income, substitution and total effects on your graph. Label all the necessary details. (4 marks)
g) Calculate the size of the income and substitution effects (IE & SE) for <u>hours of work</u> (h). *(Hint: You can solve this by setting up two equations: 1. Use the optimal condition that gives the relation between C and L (call them C_2 and L_2). 2. The utility amount from C2 and L2 needs to be equal to the original utility in part c. Substitute 1 in 2 and solve C2 and L2. Then, you can use them to calculate IE and SE.)* (4 marks)
h) Calculate the uncompensated, compensated and income elasticities of <u>labour supply (h)</u>. (3 marks)
i) <u>*Briefly explain*</u> whether leisure is a normal or inferior good. (2 marks)
j) Fill in the blanks. Zoë's labour supply curve has a _____(negative, positive, vertical) slope because the substitution effect is _____ (larger than, equal to smaller than) the income effect. (2 marks)

Scenario II) Overtime premium (16 marks)
Suppose the job offer requires her to work $h = 70$ hours per month at $\$10/h$ and double pay for every hour beyond 70. The alternative, for her, is not to work at all.

k) Show that Zoë is better off accepting the offer than the alternative. (2 marks)
l) Write down the new budget constraint knowing that the 70 hours of work is mandatory. (*Hint: The budget line is kinked so you need to define two parts. An equation for hours of work up to 70 and an equation for hours of work above 70*) (2 marks)
m) Find the optimal hours of work after accepting the offer. (*Hint: Given that the offer is accepted, you should find how many hours of the remaining available time (150-70=80) is allocated between work and leisure. Then, you can calculate the total hours of work and leisure.*) (3 marks)
n) Use the appropriate budget constraint and indifference curves and show the following on one graph. (4 marks)
    a. The optimal point in the original case.
    b. The offered hours in scenario II.
    c. The optimal choice in scenario II.

o) Fill in the blank. In scenario II, Zoë chooses to work _____ (less than, more than, equal to) the mandatory hours, because leisure is _____ (more, less**,** equally) expensive and the income effect is _____ (larger than, equal to, smaller than) the substitution effect. (3 marks)
p) Compare the two scenarios and <u>*briefly*</u>, explain which scenario suits the company's needs better? Is this also the preferred scenario for Zoë? (2 marks)

Problem Two (27 Marks)

A single mother has *y=$400* in non-labour income and *w=$15* per hour in labour income. She has up to 100 hours available from which she can decide how much to work. The tax rate is zero.

a) Write down the budget constraint and draw it on a graph. Make sure to label the axes and intercept correctly. Assume that the mother is already working 40 hours per month. Show the indifference curve and the optimal point on the graph. (3 marks)

Suppose that there is a fixed cost of $300 per month for childcare that must be paid as soon as the mother starts working.

b) Show how the fixed cost affects the budget line in part (a). Briefly, discuss her likely labour supply response. Use indifference curves on your graph to support your answer. (*Hint: leisure is a normal good*) (3 marks)
c) Determine the share of substitution and income effects in the total effect. (2 marks)

Assume that the government defines a childcare subsidy program such that mothers who are working up to 25 hours per month receive an equivalent of 80 percent of their labour income as childcare support. Those who are working between 25 to 60 hours per month are fully reimbursed. This amount decreases by 50% of the labour income earned for hours beyond 60 until it has been phased out. (*Example: If a mother works 61 hours, half of the earned income on the last hour is deducted from the full support. That is, she will receive $292.5 in childcare support.)*

d) Define the equation for the subsidy program for all three parts. (3 marks)

$$childcare\ subsidy \begin{cases} 0 \leq h \leq 25 \\ 25 < h \leq 60 \\ 60 < h \leq 100 \end{cases}$$

e) Use your answer in part (*d)* and define the budget constraint after this policy. (*Hint: budget constraint for each interval is equal to the corresponding childcare subsidy plus the budget constraint in part (b).)* (4 marks)

$$budget\ constraint \begin{cases} h = 0 \\ 0 < h \leq 25 \\ 25 < h \leq 60 \\ 60 < h \leq 100 \end{cases}$$

f) Draw the new budget constraint. Carefully label all the kinked points. (3 marks)

For part (*g)* and (*i),* put your answers in the given table.

g) Using the consumption-leisure framework, determine the <u>*likely*</u> response to the childcare subsidy program in terms of hours of work (increase, decrease, no change) if she has already been working for: (3 marks)
   i. 10 hours
   ii. 40 hours
   iii. 70 hours
h) Draw a graph to support your answers in part (g). (3 marks)
i) In part (g), determine the direction of the income and substitution effects (right: if leisure increases, left: if leisure decreases, none: if there is no effect). You do not need to show them graphically. (3 marks)

Current hours	Hours after policy implemented	Income Effect	Substitution Effect
10			
40			
70			

Problem Three (23 Marks)

Consider the following two individuals:

Person A has a strong attachment to the labour market. He is currently working 85 hours per month. Person B has an extremely weak attachment to the labour market and is in fact currently unemployed with steep indifference curves.

Assume that their utility is a function of leisure (L) and consumption (C). Consumption is equal to total income (That is, labour income plus non-labour income) where non-labour income is $y = \$50$ per individual and each has $T = 150$ hours per month to allocate between leisure and work at $w = \$10/h$. h_A and h_B are the optimal working hours for each type, respectively.

a) Write down the budget constraint and find the slope. (2 marks)
b) Given their current employment status, define a range for their reservation wages. (2 marks)
c) Draw the budget line, indifference curves (IC_A, IC_B) and label the optimal choice of leisure for each person on one graph. (2 marks)

Now assume that the government introduces a welfare program that transfers a maximum of $400 per month to each participant. This amount decreases at a 100 percent reduction rate for any labour income earned until the amount is exhausted. That is,

$$sa = 400 - 100\% * \max\{400, w * h\}$$

d) Write down the budget constraint. *(Hint: The budget line is kinked at X, so you should define both parts. X is where the welfare eligibility ends or sa=0.)* (3 marks)

$$budget\ constraint \begin{cases} 0 < h \leq X \\ X < h \leq 150 \end{cases}$$

e) Use the consumption-leisure choice model and analyze each individual's <u>likely</u> response to this policy in terms of: i) change in employment status; ii) change in hours of work; and iii) program participation. Use a graph to support your results. Clearly label all the necessary parts (ie, axis, intercepts, kinked point, etc). (6 marks)
f) *How* do your answers in part (e) change if the benefit reduction rate goes down to 50 percent such that $sa = 400 - 0.5 * \max\{400, w * h\}$. Use a graph to support your results. (8 mark)