ECONOMICS 212
Sections A & B
MIDTERM EXAM

October 20, 2008

NAME:

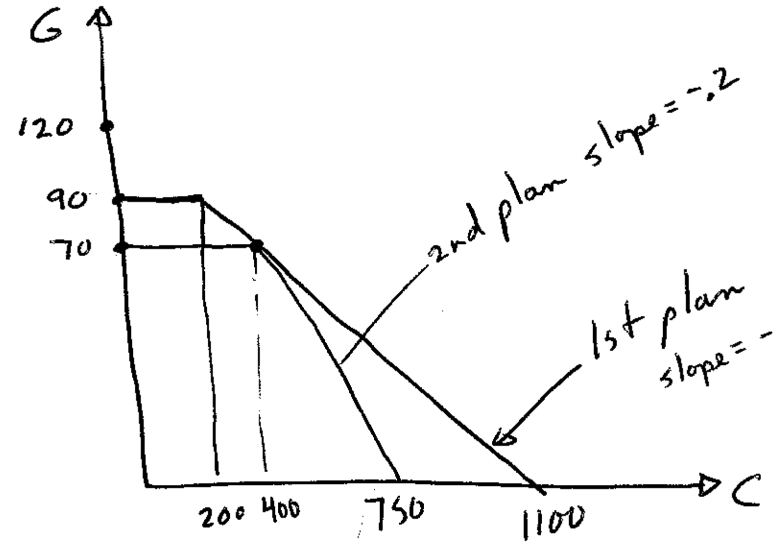
STUDENT NUMBER:

SECTION:

INSTRUCTIONS: Please answer all questions in this exam booklet. If you run out of space on a question, please continue your answer on the back of the question paper. The grade assigned to each question is indicated beside the question.

Part A

Question One [5 marks]
Ryan is considering two plans for cell phone service. The first offers 200 minutes for a flat fee of $30, with each additional minute costing ten cents per minute. The second plan offers 400 minutes for a flat fee of $50, with each additional minute available at a cost of twenty cents per minute. Ryan has $120 available to spend on cell phone service, C, and a composite consumption good, G, with a price of $1 per unit. Draw and appropriately label the budget constraints for each of the plans.



Question Two [5 marks]
With reference to the consumption opportunities defined in question one, which plan would Ryan choose if his utility function is defined by U(C, G) = C + 10G. Explain your answer.

Perfect substitutes $MU_C = 1$ $MRS = -\frac{1}{10}$

$MU_G = 10$

→ same slope as neg slope segment of 1st plan so looks like anywhere on there MAX $u = 1100$

→ also note kink of plan 2 yields $u = 1100$

But point $G = 120$ yields $U = 1200$ ∴ best can do is all G

and $G = 120$ is in feasible set of both plans.

Question Three [5 marks]
Howie has \$100 and is considering the purchase of a raffle ticket that will leave him with \$400 with probability 10%, \$200 with probability 30%, or with \$0 with probability 60%. He has a utility of income function defined by $U(I)=2I^{1/2}$, where I is income. Determine whether Howie should purchase the raffle ticket or not purchase it.

Sure thing $= \$100 \rightarrow U(100) = 20$

Bet $EV = (.1)(400) + (.3)(200) + (.6)(0) = \$100$ $\therefore$ Fair Bet

$EU(Bet) = (.1)(2)(400)^{1/2} + (.3)(2)(200)^{1/2}$

$= 4 + 8.5$ (approximately)

$EU(Bet) = 12.5 \Longrightarrow$ Refuse ticket

Part B

Question One
Art has 16 hours per day to divide between work and leisure, R. Art earns \$30 per hour when he works and uses his income to buy a consumption good, C, with a price equal to one.

a) [5 marks] Art's utility function over leisure and consumption is defined by U (R, C) = Min {30R; C}. Determine Art's optimal consumption bundle.

Budget constraint $480 = C + 30R$

Opt where $30R = C$ so $480 = 60R$

$R^* = 8$

$\Rightarrow$ work 8 hours so $C^* = 240$

b) [5 marks] Art's employer informs him that he cannot work the amount that he would prefer. Instead he must work twelve hours. Prove that Art is worse off because of his employer's requirement.

Opt choice $\rightarrow U(240; 240) = 240$

Restricted $\rightarrow$ 12 hours work $\Rightarrow$ 4 hours leisure & $C = 360$

$\rightarrow U(120; 360) = 120$

<u>Worse off</u>

c) [5 marks] Return to the optimal bundle determined in part a) of the question. If Art's wage increases to $40/hour will he choose to work more, less, or the same amount as in part a)? Explain your answer. What does the result of the wage increase tell us about the supply of labour curve over this range of wage rates?

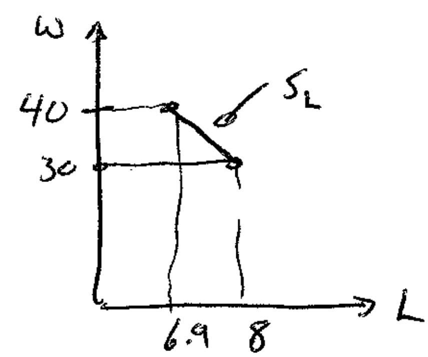
New budget constraint $640 = C + 40R$

opt where $30R = C \rightarrow 70R = 640$

$R^* = 9.1$ so work 6.9 hours

Works less $\leftarrow$ & $C^* = 276$

[Implication is negatively slope Labour supply over range]



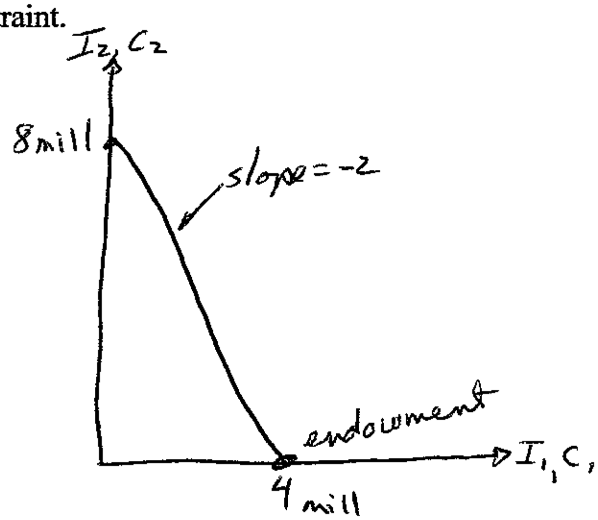
Question Two

Rashid earns \$4,000,000 in the first period (working) of his life and nothing in the second period (retired) of his life. He can save or borrow at an interest rate of 100%. Rashid's utility depends on his consumption in each period and is given by $U(C_1,C_2)= C_1C_2$, where 1 is the first period and 2 is the second period.

a) [5 marks] Write the future value version of Rashid's budget constraint and draw and appropriately label the budget constraint.

$$I_1(1+r) + I_2 = C_1(1+r) + C_2$$

$$8,000,000 = 2C_1 + C_2$$



b) [5 marks] Derive Rashid's optimal bundle and his level of savings.

$MU_1 = C_2$
$MU_2 = C_1$ $\rightarrow$ $MRS = \frac{C_2}{C_1}$ $\rightarrow$ opt cond'n $\frac{C_2}{C_1} = 2$

so $C_2 = 2C_1$

sub into constraint

$$4C_1 = 8,000,000$$

$$C_1^* = 2,000,000$$

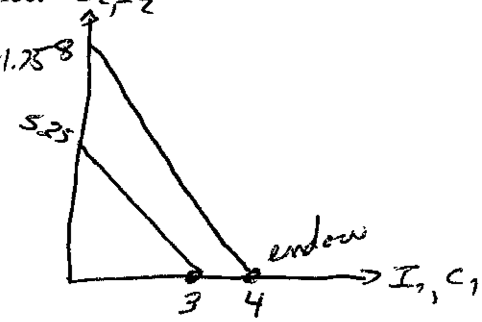
$$C_2^* = 4,000,000$$

Savings, $S^* = 2,000,000$

$3{,}000{,}000\ (1.75)$ $\frac{3}{4}(3\text{mil}) = 2.25$

c) [5 marks] Suppose the government levies an income tax on Rashid. The tax is 25% of his earnings while working and also 25% of interest earned on his savings. Explain how this tax affects Rashid's optimal choice.

→ budget constraint after tax $(1 + r - 0.25) = 1.75$



$$\rightarrow 5{,}250{,}000 = 1.75C_1 + C_2$$

$$0.75(4{,}000{,}000)(1.75) = 1.75C_1 + C_2$$

→ sub in $\cancel{C_2 = 2C_1}$ $\quad C_2/C_1 = 1.75$, $\quad C_2 = 1.75C_1$

$$\cancel{3.75C_1}\ 3.5C_1 = 5{,}250{,}000$$

after tax

$$C_1^* = 1{,}500{,}000$$

$$C_2^* = 2{,}625{,}000$$

$$\text{Savings} = [3{,}000{,}000 - 1{,}500{,}000]$$

$$S^* = 1{,}500{,}000$$

Question Three

Brigit consumes the goods X and Y according to the utility function $U(X, Y) = 2XY^{1/2}$ where the prices of the goods are P_x and P_y. Brigit has an income of I.

a) [5 marks] Derive her demand functions for the two goods.

$$MU_x = 2Y^{1/2} \qquad MU_y = XY^{-1/2}$$

$$MRS = \frac{2Y}{X} \rightarrow \text{opt condn } \frac{2Y}{X} = \frac{P_x}{P_y} \quad \begin{cases} Y = \dfrac{P_x X}{2P_y} \\ X = \dfrac{2YP_y}{P_x} \end{cases}$$

Sub in B.C.

$$P_x X + \cancel{P_y}\left[\frac{P_x X}{2\cancel{P_y}}\right] = I$$

$$3P_x X = 2I$$

$$\boxed{X^* = \frac{2I}{3P_x}}$$

Sub in B.C.

$$\cancel{P_x}\left[\frac{2YP_y}{\cancel{P_x}}\right] + P_y Y = I$$

$$3P_y Y = I$$

$$\boxed{Y^* = \frac{I}{3P_y}}$$

b) [5 marks] Let the price of X be 6 and the price of Y be 2. Brigit's income is $900. Solve for the optimal combination of the two goods.

$$X = \frac{(2)(900)}{(3)(6)} = \underline{\underline{100}} \qquad Y = \frac{900}{(3)(2)} = \underline{\underline{150}}.$$

c) [5 marks] Suppose the price of X decreases to 3. Calculate the new final demand for X and the substitution and income effects of the price decrease.

New demand for $X = \frac{(2)(900)}{(3)(3)} = \underline{\underline{200}}$ $\therefore$ X ↑ by 100 units

Original U level from (b) → $U = (2)(100)(150)^{1/2}$

$U = 2450$ (approximate)

At decomposition bundle $MRS = \frac{P_X}{P_Y}$ so $\frac{2Y}{X} = \frac{3}{2} \rightarrow Y = \frac{3X}{4}$

Sub into $2450 = (2)(X)\left(\frac{3}{4}\right)^{1/2}(X)^{1/2}$

$X^{3/2} = (1225)\cancel{\left(\frac{3}{4}\right)^{1/2}}\left(\frac{4}{3}\right)^{1/2}$

~~$X^{3/2} = (1225)(.865)$~~

~~$X^{3/2} = 1064$~~

Sub $= [X^D - 100] = 26$

Inc $= [200 - X^D] = 74$

X^{Dec} = (Sorry no calculator)

$= 126$