Intermediate Microeconomics

Econ 3101, Section 003

Midterm-Solutions

Name: ____________________________

Student Number: __________________

1 Economic Concepts

1.1 Definitions (10 Points)

- Equilibrium principle: everything adds up
- Monotonic preferences: more (of each good) is preferred to less
- Normal good: good for which demand goes down (up) when income goes down (up)
- Exogenous variable: variable whose value is determined outside the model
- Inelastic demand: demand that is not very responsive to price changes ($\|PED\| < 1$)

1.2 True or False (10 Points)

False 1. With convex preferences, people prefer one good or the other, not a mixture of both.
True 2. Giffen goods do not satisfy the law of demand.
True 3. A positive subsidy results in the expansion of the consumer's budget set.
False 4. Rationing poses no limit to what can be consumed in equilibrium.
True 5. When assets that yield the same return have different prices, arbitrage occurs.

2 Economic Models

Question 1. ***Consumer Choice.***
Suppose the representative consumer, Robinson Crusoe, has the following utility function: $u(x, y) = 7x + 12y$, where x and y denote the only two goods in the economy. Let p_x and p_y denote prices for x for y, and m income.

(a) [4] Write down the budget constraint for this consumer.

Ans: $p_x x + p_y y = m$.

(b) [12] Derive Robinson's demand for both x and y.

Ans: Robinson's demand is given by:

- For $\frac{p_y}{p_x} < \frac{12}{7}$, $x^* = 0; y^* = \frac{m}{p_y}$
- For $\frac{p_y}{p_x} > \frac{12}{7}$, $x^* = \frac{m}{p_x}; y^* = 0$
- For $\frac{p_y}{p_x} = \frac{12}{7}, (x^*, y^*) = \{(x, y) : p_x x + p_y y = m, x \geq 0, y \geq 0\}$

(c) [4] How much of x and y will Robinson consume if $p_x = p_y = 5$ and $m = 50$?

Ans: $\frac{p_y}{p_x} = 1$. Since $\frac{p_y}{p_x} < \frac{12}{7}$, from part (b) we have $x^* = 0; y^* = 10$

Question 2. ***Game Theory.***
Consider the Colluder's Dilemma. Two firms that collude successfully to suppress output can charge a higher price and hence make a larger profit (than they would by competing against each other). There is, however, an incentive to cheat: by cheating, they make even more profit but only if the other firm doesn't retaliate. If it does, they both lose out. Suppose colluding brings both parties a profit of 1000. If only one firm cheats, it makes 1200 while its partner gets 600. If retaliation occurs (i.e. they both cheat), they each get 800.
(a) [10] Construct the payoff matrix for this game.

Ans:

	Comply	Cheat
Comply	1000, 1000	600, 1200
Cheat	1200, 600	800, 800

(b) [10] Find all pure-strategy Nash equilibrium (equilibria).

Ans:

	Comply	Cheat
Comply	1000, 1000	600, $\underline{1200}$
Cheat	$\underline{1200}$, 600	$\underline{800}$, $\underline{800}$

The only Nash equilbrium in this case is **(Cheat, Cheat)**.

(c) [10] Find all purely-mixed Nash equilibrium (equilibria).

Ans: There are **no purely-mixed Nash equilibria** in this case. This is because there is a **dominant strategy (Cheat) for both players**. Alternatively, partial credit can also be awarded if the correct maximization problems are set up but the resulting answer is incorrect.

Question 3. ***Mispriced Assets.***

Consider two assets, x and y, where x yields a return p_x every period and y a return of p_y every other period starting today. The interest rate is r, where $r > 0$.

(a) [12] At what price should assets x and y be sold so that arbitrage is not possible? Write your answer in terms of p_x and p_y.

Ans: Market price should be equal to the sum of discounted present value of all future returns to prevent arbitrage.

The price for x should then be $\frac{p_x(1+r)}{r}$ and for y $\frac{p_y(1+r)^2}{r^2+2r}$

(b) [6] Suppose the return structure for asset y has changed so that it now yields p_y every other period half the time, and p_x the other half. (There is still no return to holding y every even period.) What will be the new price for this asset?

Ans: It's new price will be $\frac{p_y(1+r)^4}{(1+r)^4-1} + \frac{p_x(1+r)^4}{[(1+r)^2][(1+r)^4-1]}$.

(c) [12] Something that has been common in the lead up to the current financial crisis has been the mispricing of assets. Suppose in our model that x was mispriced and that in reality it only yields p_x with certainty every other period. What relation between p_x and p_y must hold if x and y have the same price in equilibrium? Take the return structure for y to be that given in part (b).

Ans: Find the new price for asset x: $\frac{p_x(1+r)^2}{r^2+2r}$

Equate this price with the price for y found in part (b): $\frac{p_x(1+r)^2}{r^2+2r} = \frac{p_y(1+r)^4}{(1+r)^4-1} + \frac{p_x(1+r)^4}{[(1+r)^2][(1+r)^4-1]}$

Simplifying yields $p_x = p_y$