Question 1 – Preferences (10 Points)

- Draw a pair of indifference curves that would violate transitivity. Explain why they violate transitivity.
- Draw an indifference curve that violates convexity. Explain why it violates convexity.
- Draw a pair of indifference curves that violate monotonicity. Explain why they violate monotonicity.

Question 2 – Demand (10 Points)

Your utility function for goods 1 and 2 is given by:

$$u(x_1, x_2) = \log(x_1) + x_2$$

Note: If $f(x) = \log(x)$, then $\frac{df(x)}{dx} = \frac{1}{x}$.

(i) Good 1 costs \$1 and good 2 costs \$2. You have \$10 to spend. How much of good 1 will you buy and how much of good 2 will you buy?

(ii) For each good, are they normal or inferior?

Question 3 – Intertemporal Choice (10 Points)

Your lifetime utility function is:

$$u(c_1, c_2) = c_1^{\frac{1}{2}} c_2^{\frac{1}{2}}$$

The interest rate is 10%. You earn income of \$100 in period 1 and \$110 in period 2. How much will you save/borrow in period 1?

Question 4 – Uncertainty (10 Points)

Your total assets are worth \$30,000. Included in that \$30,000 are \$20,000 worth of valuable items in your apartment. There is a 10% chance that you will be burgled. The local insurance company offers to insure each dollar of stolen items at 15¢. If you fully insure, it will cost $\$20000 \times 15¢ = \$3,000$. The remaining assets (the \$10,000) are safely locked in a secure bank vault.

Let state 1 be the case where you are burgled and state 2 be the state where you are not burgled. Call c_1 and c_2 your consumption in both states.

(i) Draw your budget contstraint for consumption across states where c_1 is on the horizontal axis and c_2 is on the vertical axis. Assume you can't "over insure" (you can only buy a maximum of \$20,000-worth of insurance) and you can't negatively insure. You are, however, able to partially insure. Label the consumption path where you don't buy insurance and where you fully insure. For each of these points, label how much you have to consume in each state of the world.

(ii) What is the slope of the budget line?

(iii) How much would an actuarially fair insurance policy cost?

(iv) What would the slope of the budget line be if the insurance was actuarially fair? Would it be steeper or flatter?

Question 5 – Equilibrium, Firm Supply and Industry Supply (12 Points)

The demand curve for a particular market is given by:

$$D(p) = 880 - 20p$$

There are 100 firms operating in this market each with a cost function $c(q) = \frac{q^2}{4}$.

(i) What is the equilibrium price and quantity?

Suddenly this good increases in popularity everyone is now willing to pay \$1 more for the good. The government decides now is a good time to introduce a value tax of 25% on the good.

(ii) What is the new equilibrium price and quantity as a result of the popularity increase and the tax? (Assume we're in the short run so that the number of firms does not change).

Question 6 – Monopoly (13 Points)

Suppose market demand curve for a particular good is given by $D(p) = 70 - \frac{1}{3}p$. There is only one firm selling this particular good. The cost function for this firm is $c(q) = 30q + 3q^2$.

(i) What price and quantity does the monopolist choose? What is its profits?

(ii) What is the elasticity of demand at the price and quantity the monopolist is operating at?

(iii) If the monopolist could perfectly price discriminate, what profits could it achieve?

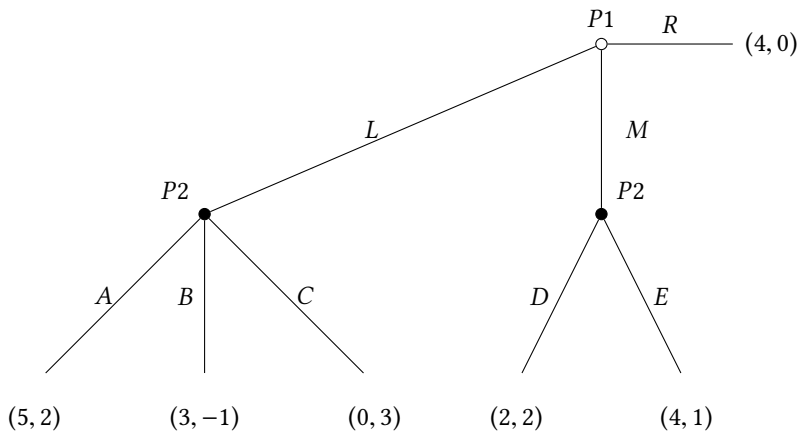
Question 7 – Game Theory (15 Points)

(i) Consider the following game:

	L	R
U	$2, 4$	$1, 3$
M	$4, 2$	$0, -1$
D	$3, 1$	$5, 3$

- Does any player have any dominated strategies?
- Find all pure-strategy Nash equilibria of the game.

(ii) Consider the following extensive form game:



Find the subgame-perfect Nash equilibirium of the game.

Question 8 – Oligopoly (20 Points)

The inverse demand curve for a product is $p(q) = 400 - q$. Two firms operate in this industry. Their marginal cost of production is constant at 100 and they have no fixed costs.

In this industry, the firms produce their output and then hand over all of their output to a government distributor. The government distributor then decides what price to charge such that all of the output will be sold. The government distributor then gives the respective revenues back to the firms. The government distributor does not charge a fee and has no costs.

(i) If the two firms compete by choosing quantities simultaneously, what output will each produce in equilibrium? What will the price be? What will each firm's profits be?

(ii) If one firm produces first and then publicly announces how much it produced before the other firm decides how much to produce, how much will each produce? What will the price be? What will their profits be?

(iii) If both firms secretly decide together how much to produce in order to jointly maximize profits, how much will they produce? Assume here that if one firm cheats on the collusion quantity that the other firm will respond very aggresively, so neither firm will want to cheat on the collusion quantity. What will the price be? What will their profits be?