

# Intermediate Microeconomics

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Midterm Exam 1

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Attempt as many questions as you have time for. Put your name and banner ID on each book you use. Don't panic! Good luck.

**Question 1** (40 points) Consider an economy consisting of two goods: Leeks and Magnesium. Felicity has 8 leeks and 9 pounds of magnesium. Gwendolyn has 4 leeks and 14 pounds of magnesium

1. Draw the Edgeworth box for this economy. Put the allocation in the Edgeworth box. Assume (for the rest of the question) that the price of magnesium is \$1 per pound. Draw the price line through the Edgeworth box if the price of leeks is \$1
2. Felicity has preferences described by the utility function  $u^F(x_L^F, x_M^F) = \ln x_L^F + \ln x_M^F$  (note that these are natural logarithms). Calculate Felicity's demand for leeks as a function of the price of leeks. Sketch Felicity's indifference curve through the endowment.
3. Gwendolyn has preferences described by the utility function  $u^G(x_L^G, x_M^G) = \min(2x_L^G, x_M^G)$  (NOTE that these are not quite the same as standard perfect compliments - there is a 2 in there!). Sketch her indifference curve through the endowment. Show that her demand for leeks is given by

$$x_L^G = \frac{4p_L + 14}{p_L + 2}$$

where  $p_L$  is the price of leeks.

4. Is the initial endowment a Pareto optimum? If not, give a bundle that Pareto dominates it.

5. Does the price of \$1 for leeks support an equilibrium? If not, why not?
6. What is the total demand for leeks from Gwen and Felicity as a function of the price of leeks? Is the total demand curve downward sloping?
7. Find an equation for the equilibrium price of leeks (note that this equation may be a quadratic, so you will not be able to solve for it explicitly).
8. In the Edgeworth box, sketch what the market equilibrium must look like (i.e., will it be a tangency point? A corner solution? - do not worry about solving for exact allocations)

**Question 2** (15 points) Cleopatra's preferences over asses milk and biscuits are given by  $u(x_a, x_b) = x_a^2 + 2x_b^2$ . Find Cleopatra's demand for asses milk and biscuits when prices are  $p_a = 1$ ,  $p_b = 1$  and income  $M = 10$

**Question 3** (10 points) Alfredo is selfish, but Bennie cares passionately about Alfredo. You have to decide how to distribute 10 walnuts between them. Alfredo's preferences are described by the utility function  $u^A = w^A$ , where  $w^A$  is the number of walnuts that Alfredo gets. Bennie's preferences are described by  $u^B = w^B + 1.5w^A$ , where  $w^B$  is the number of walnuts that Bennie gets. Is it pareto optimal to give all the walnuts to Alfredo in this economy? Is it pareto optimal to give them all to Bennie? What is the set of pareto optimal allocations in this economy?

**Question 4** (20 points) Eliza's preferences over mackerel and Dickens novels are given by  $u(x_m, x_d) = (x_m^\rho + x_d^\rho)^{\frac{1}{\rho}}$  where  $\rho < 1$

1. Assume that the optimal consumption bundle is an interior point. Show that Eliza's demand function for mackerel is given by

$$x_m = \frac{p_m^{\frac{1}{\rho-1}}}{\left(p_m^{\frac{\rho}{\rho-1}} + p_d^{\frac{\rho}{\rho-1}}\right)} M$$

2. Calculate the income elasticity and cross elasticity of demand. If you have finished the exam and you are bored, calculate the price elasticity demand for a special bonus prize (which will not affect your grade)

**Question 5** (15 points) D'Brickshaw makes choices in the following way

1. He asks both his parents what they would choose (Both of his parents make choices based on complete, transitive preferences, but Mrs. D'Brickashaw's preferences may be different from Mr. D'Brickashaw's)
2. If they agree, he chooses whatever they would choose. If they disagree, he chooses based on his own (complete, transitive) preference ordering

Does D'Brickashaw necessarily satisfy the Independence of Irrelevant Alternatives? If not, give an example where he violates IIA.