



LMH

Lady Margaret Hall

OPEN-BOOK EXERCISE 2

for

ECONOMICS VISITING STUDENT APPLICANTS

**For candidates who are mainly studying
another subject but wish to take a few courses
in Economics**

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We recommend that you spend no more than one hour attempting each question.

You are welcome to make use of your course notes and textbooks, but you should not seek assistance from any other person.

You are welcome to use a calculator.

This is not an examination: the main purpose of this exercise is to assess whether you meet the prerequisites for the Oxford economics courses that you have requested, at the point of application. We may be able to offer suitable alternatives if you do not, and will take into account the courses that you plan to take between application and admission. Please attempt each question to the best of your ability, given the courses that you have studied thus far. If you are not familiar with a concept or topic, please write a note to that effect and we will take that into account. You are welcome to attempt questions on topics that you have not previously studied, but there is no need to spend time learning new material.

All applicants who wish to take Economics as a minor subject should attempt Q1.

Q1. Please attempt each part of this question.

- (i) Solve the simultaneous equations $y = x^2 + 1$ and $2y - 3x = 4$.
- (ii) Find all roots of the equation $x^3 - 2x^2 - 9x + 18 = 0$.
- (iii) Simplify $\frac{1}{2} \ln x^4 + 3 \ln(2y)$.

Any applicant who wishes to take Intermediate Microeconomics or Intermediate Macroeconomics, but does not wish to take Calculus for Economics, should attempt Q2.

Q2. Please attempt each part of this question.

- (i) Evaluate $2 + 1 + 0.5 + 0.25 + 0.125 + \dots$.
- (ii) Find all stationary points of the function $f(x, y) = x^3 - y^3 - 3x + 12y$, and classify them.
- (iii) Find the maximum and the minimum of the function $f(x, y) = 2x + y^2$ subject to the constraint $x + y = 4$, where x and y are both non-negative real numbers.

Any applicant who wishes to take Intermediate Macroeconomics, but does not wish to take Intermediate Microeconomics, should attempt Q3.

Q3. Arthur lives in a world in which there are just two goods: nutmegs and pears. In his garden there is a tree which yields eight nutmegs and one pear every day. He has no income other than from his nutmegs and pears. Arthur's preferences over nutmegs and pears may be represented by the utility function $u(n, p) = 2 \ln n + 3 \ln p$, where n is the number of nutmegs that he consumes and p is the number of pears.

- (i) Show that Arthur's preferences may, alternatively, be represented by a utility function of the form $v(n, p) = n^\alpha p^\beta$ and explain why this is the case.
- (ii) People in Arthur's world are prepared to trade one pear for two nutmegs. Describe the relationship between the prices of pears and nutmegs and draw a carefully labelled graph of Arthur's budget constraint.
- (iii) Arthur maximises his utility, subject to his budget constraint. Show that his gross demands are 4 nutmegs and 3 pears. Mark the gross demands on your diagram and sketch in one or two of his indifference curves. What are his net demands?
- (iv) There is a shortage of nutmegs in Arthur's world, so the relative price of nutmegs increases. (Arthur's tree still produces the same yield every day.) Illustrate on your diagram what happens to his budget constraint. Will he be better off or worse off after the price change? What can you say about how his gross demands will change?
- (v) Consider the effect of the change in the price of nutmegs on Arthur's demand for nutmegs. This may be decomposed into a substitution effect, an ordinary income effect and an endowment income effect. Explain what is meant by these terms and draw a diagram to illustrate this decomposition. (Please draw a new graph for this part of the question.)