BEEM103 – Optimization Techiniques for Economists	Dieter Balkenborg Departments of Economics
Homework Week 4	University of Exeter

Exercise 1 Let Δ be the triangle spanned by the points $(-1,0)$, $(1,1)$ and $(1,-1)$. Sketch the triangle. Describe the triangle as a solution set to linear inequalities. For each point (a,b) in the plane find the point (x^*,y^*) which is closest to it using the Lagrangian approach.

Exercise 2 Use the Lagrangian method to maximize the function

$$f(x,y) = xy$$

subject to the constraint

$$x + 2y \leq 200$$

Exercise 3 A consumer has the utility function

$$u(x,y) = 5x^2 + 6xy + y^2 + 38x + 18y$$

a) Determine the marginal utility for the two commodities. Is more always better for the consumer?

b) The consumer has a budget of £40. A unit of the first commodity costs £10 and a unit of the second £5. Write down the budget equation.

c) The consumer wants to maximize his utility subject to his budget constraint. Write down the Lagrangian for this problem.

d) Calculate the first order conditions for a critical point of the Lagrangian.

e) Assume only the budget constraint binds. Derive a linear equation to be satisfied by a critical point that does not involve the Lagrange multiplier λ for the budget constraint.

f) Use the equation from e) and the budget equation to find the constrained optimum.