

Homework 2: Send in Weds 21 Sept, lunch time. Please do it on separated A4 sheets.

### Midterm 2014 Q2

Use the **Extreme Value theorem** to optimise

the function  $f(x, y) = e^{-(x^2 + y^2)}$

subject to the constraint  $x^2 + 4y^2 \leq 4$ .

### Midterm 2013 Q2

Use **Extreme Value theorem** to optimise

the function  $f(x, y) = x^2 y - 2xy^2 + 3xy + 4$

subject to the constraint  $y + 4x \leq 1$ ;  $y \geq 1$  and  $x \geq -2$ .

## Midterm 2014 Q1

For a function

$$f(x, y, z) = 2xy + 2yz + xz$$

subject to

$$xyz = C \quad \text{where } x, y, z > 0 \quad \text{and } C \text{ is a constant}$$

- (a) Given that  $C = 108$ , use the **substitution method** to calculate any possible critical point(s). In addition, use the second derivative test to classify the critical point(s).
- (b) Use the **Lagrange Multiplier method** to determine any possible critical point(s) and optimum value of the function **in term of  $C$  only**.
- (c) From (b), determine the value of  $C$ , which gives the optimum value of the function  $f^*(x^*, y^*, z^*) = 108$ , and identify the corresponding critical point.
- (d) From (b) and (c), if the constant  $C$  in the constraint equation decreases by 0.4, estimate the new optimum value of the function.

## Midterm 2012 Q2

(a) For a 2-variable function

$$f(x, y) = x^2 + y^2$$

subject to the constraint

$$x^2 + xy + y^2 = 3,$$

use the **Lagrange Multiplier** method, to determine the absolute maximum.

(8 marks)

(b) **Estimate** the maximum value(s) if the constraint changes to  $x^2 + xy + y^2 = 2.97$

(2 marks)