MA2VC, Vector Calculus, Assignment 3

due: 12pm on the 2nd of Dec 2011 (late assignments will not be accepted)

1a) (4 marks) Sketch the region, D, defined by $x \geq 0$, $y \geq 0$, and $x+y \leq 3$, and then integrate

$$\int_D xy dA$$

in the x-y plane.

1b) (6 marks) Sketch the same region, D, but this time in the u-v plane defined by the transformation $x = u + v$ and $y = u - v$. Then re-evaluate the integral in the u-v plane.

2a) (5 marks) Calculate the line integral

$$\oint_{\partial R} x dx + xy^2 dy$$

explicitly over the counter-clockwise path, ∂R, surrounding the domain, R, bounded by the curves $y = x$ and $y = x^2$.

2b) (5 marks) Evaluate the line integral by using Green's theorem to convert it to an area integral over R.