

## MA2VC, Vector Calculus, Assignment 3

due: 12pm, 30 Nov 2012 (late assignments will not be accepted, and marks will be deducted for poor presentation)

**1)** (7 marks) Evaluate the volume integral,  $\int_R x dV$ , over the tetrahedron,  $R$ , defined by  $x \geq 0$ ,  $y \geq 0$ ,  $z \geq 0$ , and  $3x + 2y + z \leq 6$ .

Demonstration of Green's theorem for

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

where  $\partial R$  is the counterclockwise path around the semi-circle,  $R$ , defined by  $0 \leq y \leq \sqrt{9 - x^2}$ .

**2a)** (7 marks) Evaluate the line integral,  $\oint_{\partial R} \mathbf{F} \cdot d\mathbf{r}$ , where  $\mathbf{F} = x^2 y \hat{\mathbf{i}} - xy^2 \hat{\mathbf{j}}$ .

**2b)** (6 marks) Then evaluate the area integral,  $\int_R [\nabla \times \mathbf{F}]_z dA$ .