

### MA2E01 Tutorial problems #8

(due at the end of your tutorial)

1. Let  $R$  be the region bounded by the curves  $y = x$  and  $y = x^2$ . Let  $C$  be the boundary of this region oriented counterclockwise. Use Green's theorem to evaluate

$$\oint_C 2xy \, dx + (x^2 + 2xy) \, dy.$$

2. Use Green's theorem to find the work done by  $\mathbf{F} = \langle 2xy, x^2 + 2xy \rangle$  while moving a particle from  $(2, 0)$  to  $(-2, 0)$  along the upper semicircle  $x^2 + y^2 = 4$  and then back to the point  $(2, 0)$  along the  $x$ -axis.
3. Compute the surface integral  $\iint_{\sigma} z^2 \, dS$  when  $\sigma$  is the part of the cylinder  $y^2 + z^2 = 4$  that lies between the planes  $x = 0$  and  $x = 3$ .
4. Find the mass of the lamina that has constant density  $\delta$  and occupies the part of the plane  $x + y + z = 1$  which lies in the first octant.