MA2E01 Tutorial problems #4
(due at the end of your tutorial)

1. Find the critical points of the function

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

and then classify them as relative minima, relative maxima or saddle points.

2. Compute each of the following integrals:

$$\int_1^3 \int_0^\pi y \sin x \, dx \, dy, \qquad \int_0^3 \int_0^2 ye^{xy} \, dx \, dy.$$

3. Let R be the triangular region whose vertices are $(0, 0)$, $(1, 0)$ and $(1, 3)$. Find the volume of the solid that lies below the plane $z = 5 - x - y$ and above the region R.

4. Let $a > 0$ be a constant. Switch the order of integration to compute the integral

$$\int_0^{2a} \int_{y/2}^a e^{x^2} \, dx \, dy.$$