MTH 203 Mathematics III (Multivariate Calculus)

Tutorial Sheet 3

1) Evaluate the following integrals:

(i) $\int_0^1 \int_0^{\sqrt{1-x^2}} \sqrt{1-y^2}\, dy\, dx$ (ii) $\int_0^{\pi} \int_x^{\pi} \frac{\sin y}{y}\, dy\, dx$ (iii) $\int_0^1 \int_y^1 x^2 \exp(xy)\, dx\, dy$

2) Evaluate $\iint_R x\, dx\, dy$ where R is the region $1 \le x(1-y) \le 2$ and $1 \le xy \le 2$

3) Using double integral, find the area enclosed by the curve $r = \sin 3\theta$ given in polar coordinates

4) Evaluate $\int_0^{\infty} (\tan^{-1} \pi x - \tan^{-1} x)\, dx$

5) Find the volume of the solid which is common to the cylinder $x^2 + y^2 = 1$ and $x^2 + z^2 = 1$