MATH 2210 - SAMPLE EXAM 3 PROBLEMS

1)
a) Evaluate

$$\int_0^4 \int_{\frac{x}{2}}^{\sqrt{x}} y\ dydx.$$

b) Sketch the region of integration, then change the order of integration and evaluate again.

2) Evaluate $\int \int_S x\ dxdy$ where S is the region in the first quadrant bounded by the circle $x^2 + y^2 = 1$ in two ways:
a) using the cartesian coordinates
b) using the polar coordinates

3) Sketch the region for the integral

$$\int_0^1 \int_0^x \int_0^y f(x,y,z)dzdydx.$$

4) Find the area of the solid obtained by intersecting the cylinders $x^2+z^2 \leq 1$ and $x^2+y^2 \leq 1$. Hint: this solid has 4 congruent sides.

5) Let P be a parallelogram with vertices (0,0), (3,1) (2,2) and (5,3). Compute $\int \int_P x+y\ dydx$ using a linear change of variable which transforms the unit square into P.

6) Find the maximum and minimum points and values of $f(x,y) = y^2 - x^2$ along the ellipse $x^2 + 4y^2 = 4$.