Math 3202 **Due Tue Feb 16** **Assignment #4**

1. Find the mass and the center of mass of lamina that occupies region D and has density $\rho(x,y)$.
   (a) $D = \{(x,y)|0 \le x \le a, 0 \le y \le b\}$, $\rho(x,y) = cxy$. Here a, b, c are positive constants.
   (b) D is the triangular region with vertices $(0,0)$, $(1,1)$, $(4,0)$; $\rho(x,y) = x$.
   (c) D is bounded by $y = \sqrt{x}$, $y = 0$, $x = 1$; $\rho(x,y) = x$.
   (d) D is the part of the disk $x^2+y^2 \le 1$ in the first quadrant. Density at point (x,y) is proportional to the square of the distance to the origine, $\rho(x,y) = c(x^2+y^2)$, where c is a positive constant.

2. Find the area of the surface:
   (a) the part of the plane $2x + 5y + z = 10$, that lies inside the cylinder $x^2 + y^2 = 9$.
   (b) the part of the paraboloid $z = 4 - x^2 - y^2$ that lies above the xy-plane.
   (c) the part of the hyperbolic paraboloid $z = y^2 - x^2$ that lies between the cylinders $x^2 + y^2 = 1$ and $x^2 + y^2 = 4$.
   (d) the part of the sphere $x^2 + y^2 + z^2 = 4z$ that lies inside the paraboloid $z = x^2 + y^2$.

3. Evaluate
   a) $\int_0^1 \int_x^{2x} \int_0^y 2xyz \, dz \, dy \, dx$.
   b) $\int_0^1 \int_0^z \int_0^y ze^{-y^2} \, dx \, dy \, dz$.