ECE 206 Advanced Calculus 2, Assignment 3 Due TBA

1: Find the volume of the region which lies under the surface $z = e^{x+y}$ and above the triangle in the xy-plane with vertices at $(0,0)$, $(1,1)$ and $(0,2)$.

2: A flat plate is in the shape of the region D bounded by $x + y = -1$ and $x + y^2 = 1$. The charge density (charge per unit area) of the plate at position (x, y) is given by $f(x, y) = xy$. Find the total charge of the plate.

3: Find the mass of the solid tetrahedron with vertices at $(0,0,0)$, $(1,0,0)$, $(0,1,0)$ and $(0,0,1)$ with density given by $f(x, y, z) = 1/(1 + x)$.

4: Find $\int_D x^2 + y \; dV$ where D is the tetrahedron bounded by $x + y + z = 2$, $z = 2$, $x = 1$ and $y = x$.

5: Use the change of coordinates map $(x, y) = g(u, v) = \big(1 + 2u + v\,,\, 1 + u + 3v\big)$ to find $\int_D e^{x-y} \; dx\, dy$ where D is the parallelogram with vertices at $(1,1)$, $(3,2)$, $(4,5)$ and $(2,4)$.

6: Use polar coordinates to find the volume of the region which lies outside the cylinder $x^2 + y^2 = 1$, inside the cylinder $x^2 + y^2 = 2x$ and inside the sphere $x^2 + y^2 + z^2 = 4$.

7: Use spherical coordinates to find the mass of the solid in the shape of the region D given by $z \geq \sqrt{x^2 + y^2}$ and $x^2 + y^2 + z^2 \leq 4$ with density given by $f(x, y, z) = 2 - z$.