14 For lecture on 11/19

1. Evaluate the integral $\iiint_E f dV$ with f and E given below. You may need to draw the region for your integral.
   (a) $f = xy + z^2$. $E = \{(x, y, z)|0 \le x \le 2, 0 \le y \le 1, 0 \le z \le 3\}$.
   (b) $f = y$. $E = \{(x, y, z)|0 \le x \le 3, 0 \le y \le x, x - y \le z \le x + y\}$.
   (c) $f = \sin y$. E is the solid below $z = x$ and above the triangle region with vertices $(0, 0, 0), (0, \pi, 0), (\pi, 0, 0)$.
   (d) $f = x - y$. E is enclosed by the surfaces $z = x^2 - 1$, $z = 1 - x^2$, $y = 0$ and $y = 2$.
   (e) $f = xz$. E is the tetrahedron with vertices $(0, 0, 0), (0, 1, 0), (0, 0, 2), (3, 0, 0)$.

2. Sketch the solid and function that is being integrated by the formula given below.
   (a) $\int_{-\pi/2}^{\pi/2} \int_0^2 \int_0^{r^2} z dz dr d\theta$.
   (b) $\int_0^2 \int_0^{2\pi} \int_0^r rz \sin\theta dz d\theta dr$.

3. Evaluate the integral $\iiint_E f dV$ with f and E given below. You may need to draw the region for your integral.
   (a) $f = \sqrt{x^2 + y^2}$. E is the solid that lies inside the cylinder $x^2+y^2 = 16$ and between the planes $z = -5$ and $z = 4$.
   (b) $f = z$. E is enclosed by the paraboloid $z = x^2 + y^2$ and the plane $z = 4$.
   (c) $f = x + y + z$. E is the solid in the first octant that lies under the paraboloid $y = 4 - x^2 - z^2$.

4. Sketch the solid and function that is being integrated by the formula given below.
   (a) $\int_0^{\pi/6} \int_0^{\pi/2} \int_0^3 \rho d\rho d\theta d\phi$.
   (b) $\int_0^{\pi/4} \int_0^{2\pi} \int_0^{\sec\phi} \rho \cos\theta \sin\phi d\rho d\theta d\phi$.

5. Evaluate the integral $\iiint_E f dV$ with f and E given below. You may need to draw the region for your integral.
   (a) $f = y^2 z^2$. E is the solid that lies above the cone $\phi = \pi/3$ and below the sphere $\rho = 1$.
   (b) $f = xe^{x^2+y^2+z^2}$. E is the solid in the first octant and between the spheres $x^2 + y^2 + z^2 = 1$ and $x^2 + y^2 + z^2 = 8$.

6. Evaluate $\iiint f\, dV$, where $f(x, y, z) = x-2y+3z$ and V is the tetrahedron with vertices (0,1,0), (1,0,1), (0,0,5) and (2,1,7).