Please see the course syllabus for details on how to turn in your homework assignments. This one is due at the beginning of your class on Friday, November 1.

1. (5 pts.) True or False:
   (a) Let $R$ denote a region in the $xy$-plane, given polar coordinates $(r, \theta)$. The expression $\int_R drd\theta$ computes the area of $R$.
   (b) Let $R$ denote a region in the $xy$-plane, given polar coordinates $(r, \theta)$. The expression $\int_R r drd\theta$ computes the area of $R$.
   (c) Let $R$ denote the plane region bounded by a circle of radius one centered at the origin. Then $\int_R x dx dy = 0$.
   (d) Let $R$ denote the plane region bounded by a circle of radius one centered at the origin and $(r, \theta)$ polar coordinates. Then $\int_R r drd\theta = 0$.
   (e) If $(x, y)$ are cartesian coordinates and $(r, \theta)$ polar coordinates for the plane, and $R$ some plane region, the expression $\int_R f(x, y) dx dy = \int_R g(r, \theta) drd\theta$ is true when $g(r, \theta) = rf(r\cos(\theta), r\sin(\theta))$.

2. (3 pts.) Set up but do NOT evaluate a double integral to compute the integral of $f(x, y) = \cos(xy)$ over the part of the unit disk (the region inside the circle of radius 1 centered at the origin) in the first quadrant (where $x > 0$, $y > 0$).

3. (3 pts.) Convert the following double integral to an equivalent polar form but do NOT evaluate:
   $$\int_0^1 \int_y^{\sqrt{4-y^2}} x^2 + y^2 dx dy$$

4. (3 pts.) Set up but do NOT evaluate a triple integral to compute the volume of the tetrahedron with vertices $(0, 0, 0)$, $(1, 0, 0)$, $(0, 2, 0)$, and $(0, 0, 1)$. The top plane of the tetrahedron is given by $2x + y + 2z = 2$. USE the order $dz dy dx$.

5. (3 pts.) Consider the tetrahedron $T$ with vertices $(1, 0, 0)$, $(1, -1, 1)$, $(1, 1, 1)$, and $(0, 0, 1)$. How many regions must $T$ be split into in order to integrate some function over $T$ with the following variable orders (each worth 1 point)? (Each answer is just 1 number!)
   (a) $dx dy dz$
   (b) $dx dz dy$
   (c) $dy dz dx$
   (It would be good practice to try setting these integrals up, but that’s not required for the problem.)

6. (3 pts.) Let $R$ be the region colored in black in the figure below. The two curves bounding $R$ are the circle $x^2 + y^2 = 1$ and the curve described in polar coordinates by the equation $r = 2\sin(2\theta)$. Set up but do NOT evaluate a (sum of) double integral(s) in polar coordinates to find the area of $R$. 

