Worksheet #20; date: 04/03/2018
MATH 53 Multivariable Calculus

1. *(Stewart 15.6.48)* Set up, but do not evaluate, integral expressions for the mass and the center of mass.

$$x^2 + y^2 + z^2 \leq 1, \quad z \geq 0, \quad \rho(x, y, z) = \sqrt{x^2 + y^2 + z^2}.$$

2. For reference, the formula for triple ntegral in spherical coordinates:

$$\iiint_E f(x, y, z)\, dV = \iiint f(\rho \sin\phi \cos\theta, \rho \sin\phi \sin\theta, \rho \cos\phi)\rho^2 \sin\phi\, d\phi\, d\theta\, d\phi.$$

3. Stewart 15.6.48 above, using spherical coordinates for integration.

4. Turn in homework now!

5. *(Stewart 15.8.30)* Find the volume of the solid that lies within the sphere $x^2 + y^2 + z^2 = 4$, above the xy-plane, and below the cone $z = \sqrt{x^2 + y^2}$.

6. *(Stewart 15.9.15)* Use the given transformation to evaluate the integral.

$$\iint_R (x - 3y)\, dA,$$

where R is the triangular region with vertices $(0, 0)$, $(2, 1)$ and $(1, 2)$; $x = 2u + v, y = u + 2v$.

7. *(Stewart 15.9.19)* Use the given transformation to evaluate the integral.

$$\iint_R xy\, dA,$$

where R is the region in the first quadrant bounded by the lines $y = x$ and $y = 3x$ and the hyperbolas $xy = 1$, $xy = 3$; $x = u/v$, $y = v$.

8. Quiz time!