Fall 2020　　ENG 5300　　Quiz 3　　Brendan McClanahan

You must show **all** work to receive full credit. All work is to be your own.　　October 12

This is a closed books and notes test. Be organized.　　Total points: **40**　　19:35-20:05

1. §10.6 Flux Integrals (3) $\iint\limits_{S} \mathbf{F} \cdot \mathbf{n} \, dA$　　Evaluate the integral for the given data. Describe the kind of surface. Show the details of your work.　　20 points

   $\mathbf{F} = [y^2, \, x^2, \, z^4], \; S : z = 4\sqrt{x^2 + y^2}, \; 0 \le z \le 8, \; y \ge 0$

Evaluate the integral by the Divergence Theorem. (Show the details.)

$\mathbf{F} = [5x^3,\, 5y^3,\, 5z^3], \quad S: x^2 + y^2 + z^2 = 4$

Hint: The following facts might be useful:

Cartesian coordinates: $dV = dx\, dy\, dz$

Cylindrical coordinates: $dV = r\, dr\, d\theta\, dz, \ \ 0 \le \theta \le 2\pi, \ \ r \ge 0, \ \ x = r\cos\theta, \ \ y = r\sin\theta, \ \ z = z$

Spherical coordinates: $dV = \rho^2 \sin\phi\, d\rho\, d\phi\, d\theta, \ \ 0 \le \theta \le 2\pi, \ \ 0 \le \phi \le \pi, \ \ \rho \ge 0,$

$$x = \rho\sin\phi\cos\theta, \ \ y = \rho\sin\phi\sin\theta, \ \ z = \rho\cos\phi$$