Fall 2020   ENG 5300   Quiz 3   Mingzuoyang Chen

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

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