Study Guide for Test #3

1. The test will cover the material in Chapters 4 and 5 in the textbook **Calculus III for Engineers and Scientists** by J.E. Franke, J.R. Griggs, and L.K. Norris

2. Know the definition of both double and triple integrals in Cartesian coordinates as the limit of Riemann sums as the norm $\|\mathcal{P}^*\|$ of the sampled partition $\mathcal{P}^*$ approaches zero.

3. Be able to sketch curves and surfaces and regions in the plane and in space using (1) standard curves in the plane, (2) ellipsoids, (3) paraboloids, (4) cones, (5) planes, and (6) cylinders

4. Double Integrals

   (a) Be able to use <u>Fubini's theorems</u> for regions $\mathcal{D}$ in the plane to set up and evaluate double integrals in **Cartesian** coordinates.

   (b) Be able to use <u>Fubini's theorems</u> for regions $\mathcal{D}$ in the plane to set up and evaluate double integrals in **polar** coordinates.

   (c) Be able to evaluate an iterated integral by reversing the order of integration.

   (d) Be able to compute area of plane regions and volume below surfaces using double integration.

   (e) Know the meaning of "mass density" $\sigma(x, y)$ of a plane lamina and how to compute the total mass of a plane lamina by computing the double integral of $\sigma(x, y)$ over the region $\mathcal{D}$.

   (f) Know how to compute the "average value" of a function $f(x, y)$ over a region $\mathcal{D}$ in the xy-plane.

   (g) Formulas for first moments of a plane lamina about the coordinate axes and for center of mass of a plane lamina will be provided on the test if they are needed.

5. Triple Integrals

   (a) Be able to use <u>Fubini's theorems</u> for regions $\mathcal{F}$ in $\mathbb{R}^3$ to set up and evaluate triple integrals in **Cartesian** coordinates.

   (b) Be able to use <u>Fubini's theorems</u> for regions $\mathcal{F}$ in $\mathbb{R}^3$ to set up and evaluate triple integrals in **cylindrical** coordinates.

   (c) Be able to use <u>Fubini's theorems</u> for regions $\mathcal{F}$ in $\mathbb{R}^3$ to set up and evaluate triple integrals in **spherical** coordinates.

   (d) Be able to compute the volume of a solid region using triple integration.

   (e) Know the meaning of "mass density" $\sigma(x, y, z)$ and how to compute the total mass of a solid body by computing the triple integration of $\sigma(x, y, z)$ over the region $\mathcal{F}$.

   (f) Know how to compute the "average value" of a function $f(x, y, z)$ over a region $\mathcal{F}$ in the $\mathbb{R}^3$.

   (g) Formulas for first and second moments of solid regions about the coordinate planes and axes and for center of mass of a solid will be provided on the test if they are needed.