# ASU Practice Midterm 3

**Multiple Choice:**

**Problem 1:** Evaluate $\int\int\int_E ze^{2x+y}\,dxdydz$ where $E$ is the box $0 \leq x \leq 2, 0 \leq y \leq 3, 0 \leq z \leq 5$

**Problem 2:** Let $E$ be the solid region bounded by the sphere of radius 4 in the first octant. Set up the integral for $\int\int\int_E \sqrt{x^2+y^2+z^2}dV$ in spherical coordinates, but do not evaluate it.

**Problem 3:** What are the cylindrical coordinates of the point whose rectangular coordinates are $(x, y, z) = (4, 3, 0)$?

**Problem 4:** Find the gradient vector field for $f(x, y) = y^2 + e^{2x}$

**Problem 5:** Suppose $F(x, y, z)$ is a gradient field with $F = \nabla f$, $S$ is a level surface of $f$ and $C$ is a curve on $S$. What is the value of $\int_C F \cdot dr$?

**Problem 6/7:** Evaluate $\int_C ydx$ where $C$ is the circle $x^2 + y^2 = 25$ with positive orientation

**Free Response:**

**Problem 1:** Let the curve $C$ be the line segment from $(2, -1, 3)$ to $(5, 1, 5)$ and let $F(x, y, z) = \langle -y, z, x\rangle$ be a force field. Calculate the work done by $F$ to move a particle along the curve $C$

**Problem 2:** Use Green's Theorem to evaluate $\int_C \left(e^{x^2} - y\right) dx + \left(2x + \sin^2(y)\right) dy$ where $C$ is the positively oriented circle $x^2 + y^2 = 36$

**Problem 3:** Let $F(x, y, z) = \left(2xyz^3\right) \mathbf{i} + \left(x^2 z^3 + \cos(y)\right) \mathbf{j} + \left(3x^2 y z^2\right) \mathbf{k}$

(a) Find a potential function for $F$

(b) Evaluate $\int_C F \cdot dr$ where $C$ is any curve from $(2, 0, 5)$ to $(3, 2, 3)$