Math 20550 Calculus III Tutorial **Name:** _____
April 9, 2015

Tutorial Worksheet

Show all your work.

1. Consider the vector field $\mathbf{F}(x, y) = x^2\mathbf{i} + x\mathbf{j}$. Let C be a path counter-clockwise around the circle $x^2 + y^2 = 9$. Compute $\int_C \mathbf{F} \cdot d\mathbf{r}$. Is $\mathbf{F}$ conservative?

2. Determine if the following vector field is conservative and find a potential function for the vector field if it is conservative.

$$\mathbf{F}(x, y) = (2xe^{xy} + x^2ye^{xy})\mathbf{i} + (x^3e^{xy} + 2y)\mathbf{j}$$

3. A particle moves through a force field $\mathbf{F} = (2x + \sin(y))\mathbf{i} + (x\cos(y) - \sin(y))\mathbf{j}$ from $(0, 0)$ to $(2, \pi)$. Show that $\mathbf{F}$ is conservative, and compute the work done by the force field ($W = \int_C \mathbf{F} \cdot d\mathbf{r}$).

4. Evaluate $\int_C \nabla f \cdot d\mathbf{r}$ where $f(x, y, z) = \cos \pi x + \sin \pi y - xyz$ and C is any path that starts at $\left(1, \frac{1}{2}, 2\right)$ and ends at $(2, 1, -1)$.