Graded by: _____ Score: _____ ID: _____

# WORKSHEET 9 - DUE 12/7

MATH 2110Q – Fall 2015
Professor Hohn

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You must show all of your work for full credit. Please circle/box your answers or write a brief sentence indicating your answer.

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1. Find the gradient vector field $\vec{F} = \nabla f$ of $f(x, y) = \sqrt{x^2 + y^2}$, sketch the vector field, and draw two level curves with $k = 1, 2$.

2. Evaluate the line integral

$$\int_C x \sin y \, ds$$

where $C$ is the line segment from $(0, 3)$ to $(4, 6)$.

3. Evaluate the line integral

$$\int_C e^x \, dx$$

where $C$ its he arc of the curve $x = y^3$ from $(-1, -1)$ to $(1, 1)$.

4. Suppose $\vec{F}$ is the vector field defined by

$$\vec{F}(x, y) = (y + 2xe^y)\hat{x} + (x + x^2e^y - 2)\hat{y}.$$

(a) Show that $\vec{F}$ is a conservative vector field.

(b) Find a potential function $f$ for $\vec{F}$ such that $\nabla f = \vec{F}$.

(c) As in parts (a) and (b), suppose $\vec{F}$ is the vector field defined by

$$\vec{F}(x, y) = (y + 2xe^y)\hat{x} + (x + x^2e^y - 2)\hat{y}.$$

Evaluate

$$\int_C \vec{F} \cdot d\vec{r}$$

where $C$ is parametrized by $\vec{r}(t) = \langle \sqrt{t}, \ln t \rangle$, $1 \leqslant t \leqslant 4$.