Math 392 Quiz 5B
February 25, 2019

Name: ____

Instructions: No calculators! Answer <u>all</u> problems in the space provided! Do your rough work on scrap paper.

1. Define the following:

$$(a)\ \int_C f(x,y)\,dy = \rule{8cm}{0.4pt}$$

$$(b)\ \int_C \vec{F}\cdot d\vec{r} = \rule{8cm}{0.4pt}$$

$$(c)\ \int_C f(x,y)\,ds = \rule{8cm}{0.4pt}$$

(where C is a smooth curve parametrized by $\vec{r}(t) =< x(t), y(t) >$. No shorthand, flesh out full definition.)

2. What does it mean to say "$\vec{F}$ is conservative"? ______________________________

3. State the equation in the fundamental theorem for line integrals: ______________________________

4. Let $\vec{F} =< P(x,y). Q(x,y) >$ be a vector field on an open, simply connected domain D. Suppose P and Q have continuous first partial derivatives on D. What equation would you use to check if $\vec{F}$ is conservative? ______________

5. (a) Assume $f(x,y,z) = y\cos z + x^3 y$. Compute $\nabla f =$ ______________________________

   (b) Let C be the piece-wise smooth curve defined by: The line segment from (1,1,0) to (1,0,0), followed by the circular arc from (1,0,0) to (-1,0,0), then followed by another line segment from (-1,0,0) to (-2, 1, $\pi/2$). Compute:

$$\int_C \nabla f\cdot d\vec{r} = \rule{8cm}{0.4pt}$$

   where $\vec{r}(t)$ is your parametrization of C.

Bonus:

1. The field $\vec{F} =< -yz\,,\ e^z - xz\,,\ ye^z - xy + 2 >$ has a (scalar) potential function $f(x,y,z)$. You do not need to verify this. Find the general form of this potential function.

   $f(x,y,z) =$ ______________________________

2. State the equation in Green's Theorem: ______________________________

3. Describe what all the symbols mean in the equation above: ______________________________

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