Math 392 Quiz 5A
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:

   $(a)\ \int_C f(x,y)\,ds =$ ______________________________

   $(b)\ \int_C \vec{F}\cdot d\vec{r} =$ ______________________________

   $(c)\ \int_C f(x,y)\,dx =$ ______________________________

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

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

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

4. Let $\vec{F} = < P(x,y). Q(x,y) >$ be defined 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 $f(x,y,z) = x\sin y + x^2 z$. Compute $\nabla f =$ ______________________________

   (b) Let C be the piece-wise smooth curve defined by: The line segment from (1,0,3) 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, $\pi/2$, 1). Compute:

   $\int_C \nabla f\cdot d\vec{r} =$ ______________________________

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

Bonus:

1. The field $\vec{F} = < e^y + yz - 2\ ,\ xe^y + xz\ ,\ xy >$ 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: ______________________________

   ____

   ____

   ____