Math 392 Quiz 3A
June 18, 2019

Name: ____

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

1. Define $\int_C \vec{F} \cdot d\vec{r} =$ ____

2. Define $\int_C f(x,y)\, dx =$ ____

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

4. State the equation in Green's Theorem: ____

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

6. Let $\vec{F}$ be a vector field whose components have continuous first and second partials. What equation would you check to determine if $\vec{F}$ is conservative in the following cases?

(a) $\vec{F} = < P(x,y), Q(x,y) >$; equation to check: ______________________________________

(b) $\vec{F} = < P(x,y), Q(x,y), R(x,y) >$; equation to check: ______________________________________

7. For us, what is the most important interpretation of $\int_C \vec{F} \cdot d\vec{r}$? ______________________________

8. Find a scalar potential f for the function $\vec{F} =< \tan^{-1} y + z^2 , \frac{x}{1+y^2} , 2xz >$. $f =$ ______________________

9. Let D be the region in the plane bounded by $x = y^2$ and $y = x^2$. Let C be the positively oriented boundary of D.

   Set-up integrals to compute (where a sum of integrals may be necessary): $\int_C (xy + y^2)dx + (x - y)dy$

   (a) Line integral(s): ____

   (b) Double integral(s): ____

   (c) Sketch the region below and orient the curve C:

Bonus:

1. What does it mean to say "$\vec{G}$ is a vector potential of $\vec{F}$"? ______________________________________

2. Define $div\ \vec{F}(x,y,z) =$ ____

3. If $curl\vec{F} = \vec{0}$, then $\vec{F}$ is called ________________________; if $div\ \vec{F} = 0$, then $\vec{F}$ is called ________________________