Math 392 Quiz 4B
February 20, 2019

Name: ____

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

1. Define the following:

$$(a)\ \int_C f(x,y)\,dy = \text{\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_}$$

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

$$(c)\ \int_C f(x,y)\,ds = \text{\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_}$$

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

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

3. (a) Sketch the region bounded by $z = 8 - x^2 - y^2$ and $z = x^2 + y^2$.

(b) Parametrize the curve of intersection, C, of the above two surfaces. Set up the limits so that the curve is traversed once.

$C: \vec{r}(t) =$ ______________________________ Limits: ________ $\leq t \leq$ ________

(c) Given $\vec{F} =< -y,\ x,\ x^2y^2 >$, find the work done by $\vec{F}$ in moving a particle around C once, by:

(i) Setting up an appropriate integral: ______________________ (ii) Evaluating: ____________

(d) Set-up: $\int_C x^2y\,ds =$ ______________________________

Bonus:

1. What does it mean for $\vec{F}$ to be "conservative"? ______________________________

2. Suppose $\vec{F} =< P(x,y), Q(x,y) >$ and that P, Q, and their first order partial derivatives are continuous on $\mathbb{R}^2$.

   What equation can be checked to see if $\vec{F}$ is conservative on $\mathbb{R}^2$? ______________________________