Math 392 Quiz 7B
March 11, 2019

Name: ANSWERS

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

1. Define the following:

   (a) $\int_C f(x,y)\,dy = \int_a^b f(x(t),y(t))\,y'(t)\,dt$

   (b) $\int_C \vec{F}\cdot d\vec{r} = \int_a^b \vec{F}(\vec{r}(t))\cdot\vec{r}\,'(t)\,dt$

   (c) $\int_C f(x,y)\,ds = \int_a^b f(x(t),y(t))\sqrt{(x'(t))^2+(y'(t))^2}\,dt$

   (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"? $\vec{F}=\nabla f$ for some scalar function f.

3. State the equation in Green's Theorem: $\int_C P\,dx + Q\,dy = \iint_D Q_x - P_y\,dA$

4. State the equation in the fundamental theorem for line integrals: $\int_C \nabla f\cdot d\vec{r} = f(\vec{r}(b)) - f(\vec{r}(a))$

5. If $curl\vec{F} = \vec{0}$, then $\vec{F}$ is called irrotational

6. 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? $\frac{\partial P}{\partial y} = \frac{\partial Q}{\partial x}$

7. Let $\vec{F} = < P(x,y), Q(x,y), R(x,y) >$ be defined on an open, simply connected domain D. Suppose P, Q, and R have continuous first partial derivatives on D. What equation would you use to check if $\vec{F}$ is conservative? $curl\vec{F} = \vec{0}$

8. Let $\vec{F} = < y\cos x\ ,\ xy^3e^z\ ,\ x\tan(yz)\ >$, compute:

   (a) $curl\vec{F} = \langle xz\sec^2(yz) - xy^3e^z,\ -\tan(yz),\ y^3e^z - \cos x\rangle$

   (b) $div\,\vec{F} = -y\sin x + 3xy^2e^z + xy\sec^2(yz)$