Ma 227 **Exam II B** **11/5/13**

Name: ________________________________

Lecture Section: ________ **Recitation Section**: _______________

I pledge my honor that I have abided by the Stevens Honor System. ___________________________________

You may not use a calculator, cell phone, or computer while taking this exam. All work must be shown to obtain full credit. Credit will not be given for work not reasonably supported. When you finish, be sure to sign the pledge.

Score on Problem #1a ________

#1b ________

#2________

#3a ________

#3b ________

#4 ________

Total Score ________

1a [20 **pts**.] Evaluate

$$\int_C \vec{F} \cdot d\vec{r}$$

where $\vec{F} = z\vec{i} + y^2\vec{j} + x\vec{k}$ and C is the curve given by

$$C : \ x(t) = t^2, y(t) = e^t, z(t) = t + 1 \quad 0 \le t \le 2$$

1b [**15 pts**.] If the function $f(x, y, z)$ has continuous second-order partial derivatives, show that

$$\text{curl}\left(\text{grad } f\right) = 0$$

2 [20 **pts**.] Find a function $\phi(x, y, z)$ such that

$$\nabla\phi = \vec{F}(x, y, z) = \left(y^2 z^{-1}\right)\vec{i} + \left(4yz + 2xyz^{-1}\right)\vec{j} + \left(2y^2 - xy^2 z^{-2}\right)\vec{k}$$

3a $\left[15\ \textbf{pts}.\right]$ Evaluate

$$\oint_C y\,dx + x^2 y\,dy$$

directly without using Green's Theorem, where C is the positively oriented circle of radius 1 centered at the origin.

3b [15 **pts**.] Evaluate the line integral in 3a, namely

$$\oint_C y\,dx + x^2 y\,dy$$

using Green's Theorem.

4 [15 **pts**.] Evaluate

$$\oint_C (y + \tan^5 x)dx + \left(2x^2 + e^{2y}\right)dy$$

Where C is the positively oriented boundary of the region R enclosed by the curves $y = \sqrt{x}$, $x = 0$, and $y = 1$. Be sure to sketch C.

Table of Integrals

$\int \sin^2 x dx = -\frac{1}{2}\cos x \sin x + \frac{1}{2}x + C$
$\int \cos^2 x dx = \frac{1}{2}\cos x \sin x + \frac{1}{2}x + C$
$\int \sin^3 x dx = -\frac{1}{3}\sin^2 x \cos x - \frac{2}{3}\cos x + C$
$\int \cos^3 x dx = \frac{1}{3}\cos^2 x \sin x + \frac{2}{3}\sin x + C$
$\int te^t dt = e^t(t-1) + C$
$\int t^2 e^t dt = e^t\left(t^2 - 2t + 2\right) + C$