Ma 227 **Exam III** **12/7/09**

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 ________

#4a ________

#4b ________

Total Score ________

1a [**15 pts**.] Evaluate the line integral

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

where $\vec{F} = z\vec{i} + y^2\vec{j} + x\vec{k}$ and C is the curve given by $\vec{r}(t) = (t+1)\vec{i} + e^t\vec{j} + t^2\vec{k},\ 0 \le t \le 2.$

1b [**15 pts**.] Let $f = f(x, y, z)$ Show that

$$\nabla \times \nabla f = 0$$

Assume that the cross partials of f are equal.

2 [**20 pts**.] The vector function

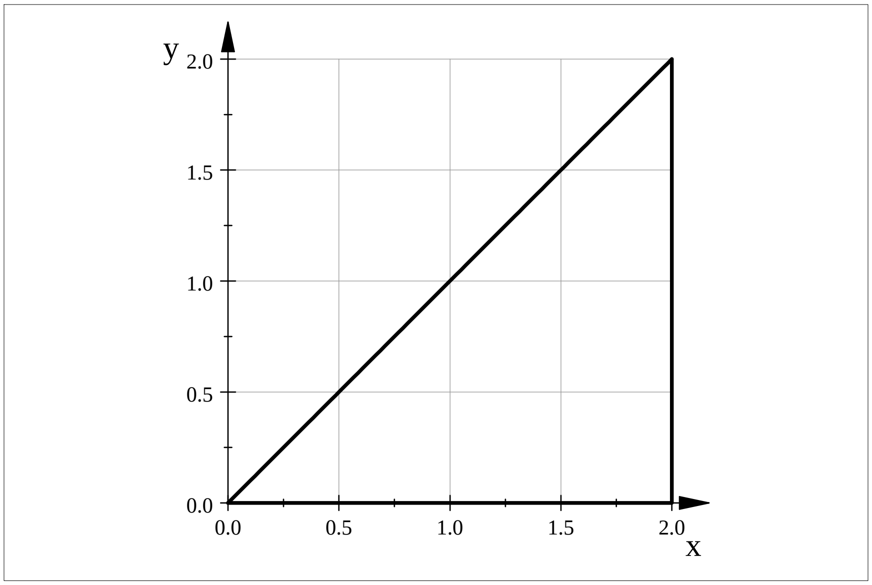
$$\vec{F} = (2xy + z)\vec{i} + x^2\vec{j} + x\vec{k}$$

is conservative. Evaluate $\int_C \vec{F} \cdot d\vec{r}$ where C is any path from $(1, -1, 2)$ to $(2, 2, 2)$.

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

$$\oint_C \sin x dx + x^2 y^3 dy$$

directly without using Green's Theorem, where C is the triangle shown below, positively oriented.



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

$$\oint_C \sin x dx + x^2 y^3 dy,$$

using Green's Theorem.

4*a* [10 **pts**] Let S be the surface $x^2 + y^2 = 4, \ \ 0 \le z \le 1.$ Sketch S and use cylindrical coordinate to obtain

a parametrization the surface. Be sure to include the ranges of the parameters in the parameter values.

4*b* [10 **pts**.] Use the parametrization obtained in 4a to obtain an iterated double integral equal to

$$\iint_S (x + y + z)dS$$

where S is the surface in part 4a. Do *not* evaluate your expression.