Ma 227 **Exam III A** **4/25/05**

Name: _____

Lecture Section: _____ **Lecturer**: _____

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 #1 _____

#2 _____

#3 _____

Total Score _____

1a [**15 pts**.] Evaluate the line integral $\int_C \vec{F} \cdot d\vec{r}$, if

$$\vec{F}(x,y) = xz\vec{i} - yz\vec{k}$$

where C is the plane path $x(t) = 4t - 1, y(t) = 2 - 2t, z(t) = t,\ 0 \leq t \leq 1$.

1b [**15 pts**.] Let $\vec{r} = x\vec{i} + y\vec{j} + z\vec{k}$ and $r = |\vec{r}|$. Show that

$$\nabla(\ln r) = \frac{\vec{r}}{r^2}$$

2a [20 **pts**.] Find a function $\Phi(x,y,z)$ such that $\nabla\Phi = \vec{F}$, where

$$\vec{F}(x,y,z) = y^2z^3\vec{i} + \left(2xyz^3 + y^2\right)\vec{j} + 3xy^2z^2\vec{k}$$

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2b [**20 pts**.] Verify that Green's Theorem is true for the line integral

$$\oint_C xydx + x^2y^3dy$$

where C is the triangle with vertices $(0,0),(1,0),(1,2)$. Sketch the triangle.

3 a [**10 pts**.] Let S be the portion of the cylinder $x^2 + y^2 = 3$ that lies between $z = 0$ and $z = 6$. Use cylindrical coordinates to give a parametrization of S.

3 b [**20 pts**.] Give an expression for

$$\iint_S y dS$$

where S is the surface in part 3a. Do *not* evaluate your expression.