Name: ____

October 29$^{\text{th}}$, 2014.
Math 2401; Sections D1, D2, D3.
Georgia Institute of Technology
Exam 3

I commit to uphold the ideals of honor and integrity by refusing to betray the trust bestowed upon me as a member of the Georgia Tech community. By signing my name below I pledge that I have neither given nor received help on this exam.

Pledged: ____

Problem	Possible Score	Earned Score
1	20	
2	20	
3	20	
4	20	
5	20	
Total	100	

Remember that you must SHOW YOUR WORK to receive credit!

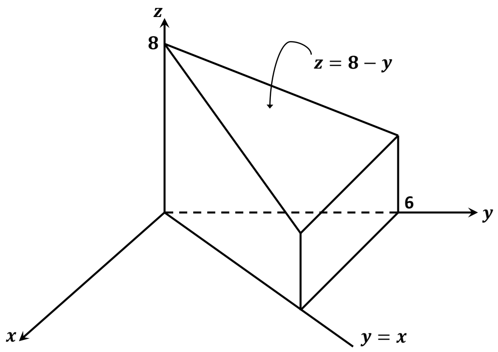
Good luck!

1. [20 points] Find the volume of the region in space bounded above by the surface $z = 4\cos(x)\sin(y)$ and below by the rectangle: $0 \leq x \leq {}^{\pi}/_{6}$, $0 \leq y \leq {}^{\pi}/_{4}$.

4. [20 points] a). Set up the integral for evaluating

$$\int\int\int_D r\,dz\,dr\,d\theta$$

over the solid D shown in the figure below: D is the prism whose base is the triangle in the xy-plane bounded by the y-axis and the lines $y = x$, $y = 6$, and whose top lies in the plane $z = 8 - y$.



b). Set up a double integral of the form:

$$\int\int_R f(x, y)\,dx\,dy$$

which would give the volume of the solid D in part a).

5. [20 points] Compute the integral:

$$\int_0^1 \int_0^\pi \int_{y/2}^{\pi/2} \frac{z\cos(x)}{x}\, dx\, dy\, dz.$$

Name: ____

November 19th, 2014.
Math 2401; Sections D1, D2, D3.
Georgia Institute of Technology
Exam 4

I commit to uphold the ideals of honor and integrity by refusing to betray the trust bestowed upon me as a member of the Georgia Tech community. By signing my name below I pledge that I have neither given nor received help on this exam.

Pledged: ____

Problem	Possible Score	Earned Score
1	25	
2	25	
3	20	
4	15	
5	15	
Total	100	

Remember that you must SHOW YOUR WORK to receive credit!

Good luck!

1. [25 points] Find:

$$\int_C f\, ds,$$

where $f(x, y) = x + y$, and C, positively oriented, is the quarter of the circle $x^2 + y^2 = 16$ lying in the third quadrant.

2. [25 points] Recall Green's formulas:

$$\boxed{\oint_C \vec{F}\cdot\vec{n}\,ds = \oint_C M\,dy - N\,dx = \int\int_R \left(\frac{\partial M}{\partial x} + \frac{\partial N}{\partial y}\right)\,dA},$$

$$\boxed{\oint_C \vec{F}\cdot\vec{T}\,ds = \oint_C M\,dx + N\,dy = \int\int_R \left(\frac{\partial N}{\partial x} - \frac{\partial M}{\partial y}\right)\,dA}.$$

Let the field:

$$\vec{F} = (5xy + y^2)\vec{i} + (5x - y)\vec{j},$$

and let C be the boundary of the region in the first quadrant enclosed by the curves $x = y^2$ and $y = x^2$. Use Green's Theorem to fill in the blanks below, expressing the flux and circulation of $\vec{F}$ over C as double integrals over the region enclosed by C in the plane.

$$\text{Flux of } \vec{F} \text{ over } C = \int_{\boxed{}}^{\boxed{}} \int_{\boxed{}}^{\boxed{}} \boxed{}\, dy\,dx.$$

$$\text{Circulation of } \vec{F} \text{ over } C = \int_{\boxed{}}^{\boxed{}} \int_{\boxed{}}^{\boxed{}} \boxed{}\, dx\,dy.$$

Be careful at the order of integration!
Do not compute the values of the integrals.

3. [20 points] The following field:

$$\vec{F}(x,y,z) = \left\langle 2xye^{x^2y}, \quad x^2e^{x^2y} + \ln(z), \quad \frac{y}{z} \right\rangle$$

is conservative.

a). Find a potential function f for this field.

b). Compute $\int_C \vec{F} \cdot d\vec{r}$, where C is a smooth path from $(1, 0, 3)$ to $(0, 1, e^3)$.

c). Compute $\oint_C \vec{F} \cdot d\vec{r}$, where C is a simple closed curve (loop).

4. [15 points] Find the area of the region enclosed by the sinusoidal curve:

$$\vec{r}(t) = \sin(2t)\vec{i} + \sin(t)\vec{j},\ 0 \leq t \leq \pi$$

in the xy-plane, pictured below. You may use Green's area formula:

$$A = \frac{1}{2} \oint_C x\,dy - y\,dx,$$

or any other method you like. You may need to recall that:

$$\sin(2\theta) = 2\sin(\theta)\cos(\theta) \text{ and } \cos(2\theta) = \cos^2(\theta) - \sin^2(\theta) = 2\cos^2(\theta) - 1 = 1 - 2\sin^2(\theta).$$