More review for Calc 3 Test 3

1. Set up the integral of the function $f(x, y, z) = zx + y$ over the tetrahedron with vertices (0,0,0), (3,0,0), (2,1,0), (0,0,6). Set up as just one triple integral. Don't integrate–just set up.

2. Let $\vec{\mathbf{F}} = \langle z2^x \ln 2 + \sin y,\ 6ye^z + x\cos y,\ 2^x + 3y^2e^z \rangle$.

(a) Find the divergence of $\vec{\mathbf{F}}$.

(b) Find the potential function f for $\vec{\mathbf{F}}$. (It can be found!)

(c) Find the curl of $\vec{\mathbf{F}}$.

(d) Find $\int_C \vec{\mathbf{F}} \cdot d\vec{\mathbf{r}}$ where C is the triangle from (7,0,2) to (1,1,2) to (0,3,5) and back to (7,0,2).

3. Let $\vec{\mathbf{F}} = \left\langle y^2,\ 3x - z^2,\ \dfrac{y}{x-1} \right\rangle$, let $g(x,y) = x - e^{xy}$ and C be the curve on the surface $z = g(x,y)$ above the triangle that goes from (0,0) to (1,5) to (0,3) and back to (0,0).

   Set up $\int_C \vec{\mathbf{F}} \cdot d\vec{\mathbf{r}}$ using Stokes' theorem and **only** variables x and y. Just set up, don't integrate, and **make sure** you have only variables x and y in your answer.

4. Let $\vec{\mathbf{F}} = \langle 3y,\ (x-1)^6,\ zx+2 \rangle$.

   Let C be the curve given by $\vec{\mathbf{r}}(t) = \langle e^t,\ \sin t,\ 3t \rangle$ for $2 \leq t \leq 5$. Set up the integral $\int_C \vec{\mathbf{F}} \cdot d\vec{\mathbf{r}}$ using **only** the variable t. Just set up, don't integrate, and **make sure** t is the only variable in your answer.