Name:_____

Math 2030, Winter 2016, Quiz 13x
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Let $\mathcal{S}$ be the surface $\mathbf{r}(x,y) = (x, y, x^2 + y^2)$ over the disk $x^2 + y^2 \leq 1$.
Let $\mathbf{F}(x,y,z) = (2y, 0, z)$.

1. Compute $\mathbf{n}\ dS = \dfrac{\partial \mathbf{r}}{\partial x} \times \dfrac{\partial \mathbf{r}}{\partial y}\ dA$.
2. Compute $\nabla \times \mathbf{F}$.
3. Compute $\displaystyle\iint_{\mathcal{S}} \nabla \times \mathbf{F} \cdot \mathbf{n}\ dS$.

   Let $\mathbf{r}(\theta) = (\cos(\theta), \sin(\theta), 1)$, $0 \leq \theta \leq 2\pi$, be the boundary, $\partial\mathcal{S}$.

4. Compute $d\mathbf{r} = \dfrac{d\mathbf{r}}{d\theta}\ d\theta$.
5. Compute $\displaystyle\int_{\partial\mathcal{S}} \mathbf{F} \cdot d\mathbf{r}$.