Quiz 8 * Math 335 * Prof. Victor Matveev

1. **(16pts)** Calculate the flux $\iint_S \mathbf{F} \cdot d\mathbf{S}$ of the vector field $\mathbf{F}=(y^2, y, 0)$ across the curved surface $x = y^2 + z^2$ constrained between the planes $x=0$ and $x=2$, with the normal pointing outward. Use Cartesian coordinates to parametrize this surface.

2. **(4pts)** Which of the following integrals is/are zero for any differentiable vector field $\mathbf{F}$ or scalar field f? Explain *very briefly*. Hint: Stokes theorem may be helpful.

   a) $\oint_C \mathbf{F} \cdot d\mathbf{r}$ b) $\oint_C \nabla \times \mathbf{F} \cdot d\mathbf{r}$ c) $\oint_C \nabla f \cdot d\mathbf{r}$ d) $\oiint_S \nabla \times \mathbf{F} \cdot d\mathbf{S}$