Your name:

Instructor (please circle):

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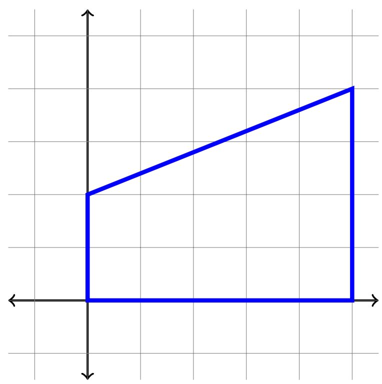
Math 11 Fall 2015, Homework 9, not to be turned in. For practice only!
Please show your work. No credit is given for solutions without work or justification.

(1) Let $\mathcal{C}$ be the curve shown below, oriented clockwise. (You may assume all the segments are straight lines.) Let $\boldsymbol{F} = \langle x\sin(x) + 3y,\ x^2 + \tan^2(y)\rangle$. Find $\oint_{\mathcal{C}} \boldsymbol{F} \cdot d\boldsymbol{r}$.



(2) Consider the 4-sided triangular pyramid formed by the vertices $(0,0,0)$, $(1,0,0)$, $(0,1,0)$, $(0,0,1)$. Let S be the surface formed by the upper three sides (all except the side in the xy-plane), with inward-facing normal vectors. Let $\boldsymbol{F} = \langle 0, y, 2x - z \rangle$. Find $\iint_S \boldsymbol{F} \cdot d\boldsymbol{S}$. You may (should!) use the fact that $\operatorname{curl}\left(\langle yz, x^2 + z, y \rangle\right) = \boldsymbol{F}$.

(*Note:* Make sure you carefully consider which way normal vectors point for any other surfaces you use.)

(3) Let S be the surface of the solid bounded by the cylinder $x^2 + y^2 = 1$ and the planes $z = -1$ and $z = 2$ (so, S involves the outside of the cylinder as well as the top and bottom circular caps), with inward-facing normal vectors. Let $\boldsymbol{F} = \langle x^3, ze^x, 3zy^2 \rangle$. Find $\displaystyle\iint_S \boldsymbol{F} \cdot d\boldsymbol{S}$.