PS#29!

Nueva Multivariable Calculus

1. Write a thank-you note to your trip lead! For 12th graders, that's Rob Zomber—did any of you get a good look at his face last week? He was working *so hard* for each of you. Like all good writing, it should be *specific* and *concrete*—in other words, include some specific details about what made your trip great and what your best memories of it were. Thet trip leads (unlike me!) really did work *extremely* hard to make all this happen—they deserve your (and my) appreciation. (BCC me on your thank-you note so I know you sent it!)

2. Consider the function:
$$f : \mathbb{R}^3 \to \mathbb{R}^1$$
$$f(x, y, z) = y^2$$
And the horizontal-organ-pipe shape S:
$$S = \substack{\text{a cylinder of radius 1 centered along the } y\text{-axis} \\ \text{between the planes } y = 0 \text{ and } y = 3 - x}$$
What's the total value of the function f on the surface of S? (Obviously draw some pictures here, too... this Sage QA might be helpful.)

3. Consider the fun and very high-dimensional function:
$$f : \mathbb{R}^3 \to \mathbb{R}^4$$
$$f(x, y, z) = \begin{bmatrix} z^2 - \sin(y) \\ x + y + z \\ e^y + 7x \\ \ln(x + y - 2z) \end{bmatrix}$$
Write out its derivative matrix (i.e., the matrix of all $3 \cdot 4 = 12$ of its partial derivatives). (Other people call this the "Jacobian;" I like "derivative matrix" or just "derivative" better, since it's more descriptive—it really is just the generalization of a derivative into higher dimensions. If you don't remember how to do this, look at our Derivatives in Higher Dimensions notes, either via that link or on Canvas.)