

MATH 13, FALL '16

HOMework 8

Due Wednesday Nov 9

Write your answers neatly and clearly. Use complete sentences, and label any diagrams. List problems in numerical order and staple all pages together. Start each problem on a new page. Please show your work; no credit is given for solutions without work or justification.

Remember that you may discuss the problems with classmates, but all work should be your own. List the names of anybody with whom you discussed the problems at the top of the page.

1. Use surface integrals to find the integral of $f(x, y, z) = x + z^2$ of the cylinder given by $x^2 + y^2 = 4$ and $-2 \leq z \leq 2$, including the top and bottom caps of the cylinder. (You should need three surface integrals. Think very carefully about your answers to each part to check if they make sense. For example: "If I integrate this function on these points, should my answer be positive or negative?")
2. Compute $\iint_S \mathbf{F} \cdot d\mathbf{S}$ for $\mathbf{F} = \langle 0, 0, z + y \rangle$ where S is the cone $2x^2 + 2y^2 = z^2$ between $z = 0$ and $z = 1$, with upward pointing normal vector.
3. Evaluate $\iint_S yz \, dS$ where S is the triangle with vertices $(1, 0, 0)$, $(0, 2, 0)$, $(0, 1, 1)$.

(Hints: First you'll want to find an equation for the plane of the form $ax + by + cz = K$. One way to do this is to find a normal vector for the plane: if $\langle A, B, C \rangle$ is orthogonal to the plane, then $Ax + By + Cz = K$ is an equation for the plane (you just have to find the right K). Recall from Math 8 that you can find a normal vector for a plane by finding two vectors that lie in the plane and aren't parallel to each other, then computing their cross product.

Then, what's the projection of the triangle onto the xy -plane? Just ignore the z -coordinates.)

For this question, feel free to use a calculator (or Wolfram Alpha) for any expanding or simplifying polynomials.