Instructions: Write complete legible solutions to the following problems in the space provided. Be sure to supply all the necessary steps that lead to your answers.

1. Evaluate the surface integral $\iint y ds$, where S is the helicoid with vector equation $\mathbf{r}(u, v) = \langle u\cos v, u\sin v, v\rangle$, $0 \le u \le 8,\ 0 \le v \le \pi$.

2. Evaluate the surface integral $\iint_S x^2 yz dS$, where S is the part of the plane $z = 1 + 2x + 3y$, that lies above the rectangle $0 \le x \le 6,\ 0 \le y \le 2$.

3. Evaluate the surface integral

$\iint_S xz\,dS$, where S is the boundary of the region enclosed by the cylinder $y^2 + z^2 = 9$ and the planes $x = 0$, and $x + y = 5$

4. Evaluate the surface integral $\iint_S \mathbf{F} \cdot d\mathbf{S}$ for the given vector field $\mathbf{F}$ and the oriented surface $\mathbf{S}$. In other words, find the flux of $\mathbf{F}$ across $\mathbf{S}$.
$F(x, y, z) = xz\mathbf{i} + x\mathbf{j} + y\mathbf{k}$,and $\mathbf{S}$ is the hemisphere $x^2 + y^2 + z^2 = 25,\ y \geq 0$ oriented in the direction of the positive y-axis.