The boundary curve C is the circle in the yz -plane. By Equation 3, $\iint_{S_1} \operatorname{curl} \mathbf{F} \cdot d\mathbf{S} = \oint_C \mathbf{F} \cdot d\mathbf{r} = \iint_{S_2} \operatorname{curl} \mathbf{F} \cdot d\mathbf{S}$ where S_1 is the original hemisphere and S_2 is the disk $y^2 + z^2 \leq 36$, $x = 0$.
$\operatorname{curl} \mathbf{F} = (x - x^2)\,\mathbf{i} - (y + e^{xy} \sin z)\,\mathbf{j} + (2xz - xe^{xy} \cos z)\,\mathbf{k}$, and for S_2 we choose $\mathbf{n} = \mathbf{i}$ so that C has the same orientation for both surfaces. Then $\operatorname{curl} \mathbf{F} \cdot \mathbf{n} = x - x^2$ on S_2 , where $x = 0$.
Thus $\iint_{S_2} \operatorname{curl} \mathbf{F} \cdot d\mathbf{S} = \iint\limits_{y^2+z^2 \leq 36} (x - x^2)\, dA = \iint\limits_{y^2+z^2 \leq 36} 0\, dA = 0$.

Alternatively, we can evaluate $\oint_C \mathbf{F} \cdot d\mathbf{r}$: C with positive orientation is given by $\mathbf{r}(t) = \langle 0, 6\cos t, 6 \sin t \rangle$, $0 \leq t \leq 2\pi$, and

$$\begin{aligned} \iint_S \operatorname{curl} \mathbf{F} \cdot d\mathbf{S} &= \oint_C \mathbf{F} \cdot d\mathbf{r} \\ &= \int_0^{2\pi} \left\langle e^{0(6\cos t)} \cos(6 \sin t), (0)^2\,(6 \sin t)\,, (0)(6 \cos t) \right\rangle \\ &\cdot \langle 0, -6 \sin t, 6 \cos t \rangle\, dt \\ &= \int_0^{2\pi} 0\, dt = 0 \ . \end{aligned}$$