$$\oint_C \boldsymbol{F} \cdot \mathrm{d}\boldsymbol{r} \quad \text{where} \quad \boldsymbol{F} = \langle -3x^2 + 3yz + 4z^2, -x^2 + 3xz + 2y, 3xy - y^2 \rangle$$

$$\boldsymbol{r}(s,t) = \langle s, t, -3s - t + 5 \rangle \; \{0 \leq s \leq 2, 0 \leq t \leq 1\}$$

$$\begin{aligned}
\oint_C \boldsymbol{F} \cdot \mathrm{d}s &= \iint_S \boldsymbol{\nabla} \times \boldsymbol{F} \cdot \mathrm{d}\boldsymbol{S} \\
&= \int_0^1 \int_0^2 (\boldsymbol{\nabla} \times \boldsymbol{F})(\boldsymbol{r}(s,t)) \cdot \left(\frac{\partial \boldsymbol{r}}{\partial s} \times \frac{\partial \boldsymbol{r}}{\partial t} \right) \, \mathrm{d}s \, \mathrm{d}t \\
&= \int_0^1 \int_0^2 \langle -2t, 8(-3s - t + 5), -2s \rangle \cdot \langle 3, 1, 1 \rangle \, \mathrm{d}s \, \mathrm{d}t \\
&= \int_0^1 \int_0^2 -6t - 24s - 8t + 40 - 2s \, \mathrm{d}s \, \mathrm{d}t \\
&= \int_0^1 \int_0^2 -14t - 26s + 40 \, \mathrm{d}s \, \mathrm{d}t \\
&= \int_0^1 -14ts - 13s^2 + 40s \Big|_{s=0}^{2} \, \mathrm{d}t \\
&= \int_0^1 -28t - 52 + 80 \, \mathrm{d}t \\
&= -14t^2 - 28t \Big|_{t=0}^{1} \\
&= 42
\end{aligned}$$