$\mathbf{r}_u = \langle 0, 1, -4 \rangle$, $\mathbf{r}_v = \langle 1, -3, 1 \rangle$, and $\mathbf{r}_u \times \mathbf{r}_v = \langle -11, -4, -1 \rangle$. Then by Definition

$$\begin{aligned} A(S) &= \iint_D |\, \mathbf{r}_u \times \mathbf{r}_v \,|\, dA = \int_0^1 \int_0^1 |\, \langle -11, -4, -1 \rangle \,|\, du\, dv = \sqrt{138} \int_0^1 du \int_0^1 dv \\ &= \sqrt{138} \end{aligned}$$