Math is fun!

Suppose $C$ is the oriented simple closed curve shown, given by $r(t) = ((2 + \cos(6\pi t)) \cos(4\pi t), (2 + \cos(6\pi t)) \sin(4\pi t), \sin(6\pi t))$, for $t \in [0, 1]$, and $\mathbf{F} = \langle yz, xz, xy \rangle$. Compute

$$\int_C \mathbf{F} \cdot d\mathbf{r} = \ldots$$

A  -1
B  0
C  1
D  I got something different.
E  I don't know what to do.
Let \( \mathbf{F} = \langle x, y, -2z \rangle \). Compute the flux:

\[
\iiint_{S} \mathbf{F} \cdot d\mathbf{S}
\]

where \( S \) is the part of the cone \( x^2 + y^2 = z^2 \) with \( 0 \leq z \leq 1 \), oriented with “outward” pointing normal.

A. \(-2\pi\)

B. 0

C. \(2\pi\)

D. I got something different.

E. I don’t know what to do.
Fundamental Theorems of Calculus

\[ \int_{a}^{b} f'(x) \, dx = f(b) - f(a) \]  
Fundamental Theorem of Calculus

\[ \int_{C} \nabla f \cdot d\mathbf{r} = f(b) - f(a) \]  
Fundamental Theorem of Line Integrals

\[ \iint_{D} Q_x - P_y \, dA = \int_{\partial D} \langle P, Q \rangle \cdot d\mathbf{r} \]  
Green’s Theorem

\[ \iiint_{S} \text{curl}(\mathbf{F}) \cdot d\mathbf{S} = \int_{\partial S} \mathbf{F} \cdot d\mathbf{r} \]  
Stokes’ Theorem

\[ \iiint_{R} \text{div}(\mathbf{F}) \, dV = \iint_{\partial R} \mathbf{F} \cdot d\mathbf{S} \]  
Divergence Theorem
Let \( \mathbf{F} = \langle y^2 \sin(z), e^x \cos(z^2), z + xy^2 \rangle \). Compute

\[
\iint_S \mathbf{F} \cdot d\mathbf{S}.
\]

where \( S \) is the sphere oriented with the outward pointing normal vector.

A. \(-\frac{4\pi}{3}\)

B. \(0\)

C. \(\frac{4\pi}{3}\)

D. I got something different.

E. I don’t know what to do.