1. Use an appropriate change of coordinates to calculate the integral $\iiint_E z\, dV$ where E is the solid bounded above by $4x^2 + 9y^2 + z^2 = 1$ and below by $4x^2 + 9y^2 = z^2$ in the first octant.

2. Evaluate the line integral $\int_{\mathcal{C}} yz\, dx + xz\, dy + xy\, dz$ where $\mathcal{C}$ is the curve parameterized by $\mathbf{r}(t) = \langle t, t^2, t^3 \rangle$, $0 \le t \le 1$.