

First let $u = x^2 + 4$, $dv = e^{-x} dx \Rightarrow du = 2x dx$, $v = -e^{-x}$.

$$\int_0^1 (x^2 + 4)e^{-x} dx = [-(x^2 + 4)e^{-x}]_0^1 + \int_0^1 2xe^{-x} dx$$

$$= -5e^{-1} + 4 + 2 \int_0^1 xe^{-x} dx.$$

Next let $U = x$, $dV = e^{-x} dx \Rightarrow dU = dx$, $V = -e^{-x}$.

$$\int_0^1 xe^{-x} dx = [-xe^{-x}]_0^1 + \int_0^1 e^{-x} dx = -e^{-1} + [-e^{-x}]_0^1 = -e^{-1} - e^{-1} + 1$$

$$= -2e^{-1} + 1. \text{ So } \int_0^1 (x^2 + 4)e^{-x} dx = -5e^{-1} + 4 + 2(-2e^{-1} + 1)$$

$$= -5e^{-1} + 4 - 4e^{-1} + 2 = -9e^{-1} + 6.$$