

$$2. \int_{z=0}^{z=1} \int_{x=0}^{x=2} \int_{y=0}^{y=x} (ze^{x^2}) dy dx dz$$

$$= \int_{z=0}^{z=1} \int_{x=0}^{x=2} \left[yze^{x^2} \right]_{y=0}^{y=x} dx dz$$

$$= \int_{z=0}^{z=1} \int_{x=0}^{x=2} ze^{x^2} [x-0] dx dz$$

$$= \int_{z=0}^{z=1} z \int_{x=0}^{x=2} xe^{x^2} dx dz$$

$u = x^2 \quad du = 2x dx$

$$= \frac{1}{2} \int_{z=0}^{z=1} z \int_{x=0}^{x=2} 2xe^{x^2} dx dz$$

$$= \frac{1}{2} \int_{z=0}^{z=1} z \int_{x=0}^{x=2} e^u du dz$$

$$= \frac{1}{2} \int_{z=0}^{z=1} z \left[e^u \right]_{x=0}^{x=2} dz$$

$$= \frac{1}{2} \int_{z=0}^{z=1} z \left[e^{x^2} \right]_{x=0}^{x=2} dz$$

$$= \frac{1}{2} \int_{z=0}^{z=1} z [e^2 - e^0] dz$$

$$= \frac{1}{2} \int_{z=0}^{z=1} z (e^4 - 1) dz$$

$$= \frac{1}{2} (e^4 - 1) \int_{z=0}^{z=1} z dz$$

$$= \frac{1}{2} (e^4 - 1) \left[\frac{1}{2} z^2 \right]_{z=0}^{z=1}$$

$$= \frac{1}{2} \cdot \frac{1}{2} (e^4 - 1) [1^2 - 0^2]$$

$$= \frac{1}{4} (e^4 - 1)$$