

Total time: 10 minutes.

Problem 1 (5 points). Calculate the following iterated integral:

$$\int_0^1 \int_0^2 \int_0^{1-x} xy \, dz \, dy \, dx$$
$$= \int_0^1 \int_0^2 (1-x)xy \, dy \, dx = \int_0^1 (x-x^2) \, dx \cdot \int_0^2 y \, dy = \left(\frac{1}{2}x^2 - \frac{1}{3}x^3\right)\Big|_0^1 \cdot \frac{1}{2}y^2\Big|_0^2 = \frac{1}{6} \cdot 2 = \frac{1}{3}$$

Problem 2 (5 points). Let E be the three-dimensional region inside the cylinder $x^2 + y^2 = 4$, in the first octant, below the plane $z = 1$. Write an iterated integral to represent

$$\iiint_E x \, dV$$

You DO NOT need to calculate this iterated integral.

Either of the following is good:

in cylindrical:

$$\int_0^2 \int_0^{\pi/2} \int_0^1 r \cos \theta \, dz \, r \, d\theta \, dr$$

in (x, y, z) :

$$\int_0^2 \int_0^{\sqrt{4-x^2}} \int_0^1 x \, dz \, dy \, dx$$