1) Evaluate the integral $\iiint_E (xz - y^3)\,dV$, where $E = \{(x, y, z) \mid -1 \le x \le 1,\ 0 \le y \le 2,\ 0 \le z \le 1\}$.

2) Evaluate the iterated integral:

a) $\int_0^1 \int_0^z \int_0^{x+z} 6xz\ dy\,dx\,dz$

b) $\int_0^1 \int_0^z \int_0^y ze^{-y^2}\ dx\,dy\,dz$

3) Evaluate the triple integral:

a) $\iiint_E 2x\,dV$ where, $E=\left\{(x,y,z)\,|\,0\le y\le 2,\ 0\le x\le\sqrt{4-y^2},\ 0\le z\le y\right\}$

b) $\iiint_E 6xy\,dV$, where E lies under the plane $z=1+x+y$ and above the region in the xy-plane bounded by the curves $y=\sqrt{x},\ y=0,\ x=1$.

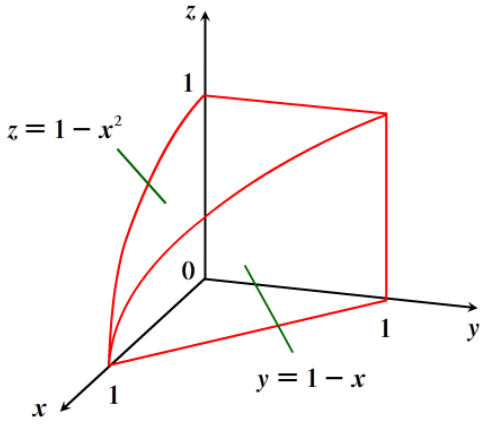
c) $\iiint_E xz\,dV$, where E is the solid tetrahedron with vertices $(0,0,0)$, $(0,1,0)$, $(1,1,0)$, and $(0,1,1)$.

d) $\iiint_E x^2e^y\,dV$, where E is bounded by the parabolic cylinder $z=1-y^2$ and the planes $z=0,\ x=1,\ x=-1$.

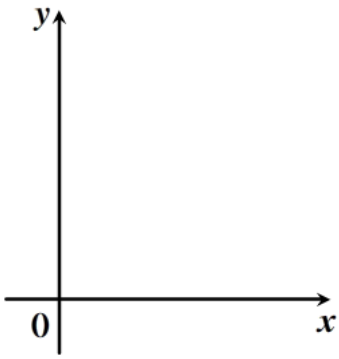
e) $\iiint_E x\,dV$, where E is bounded by the paraboloid $x=4y^2+4z^2$ and the plane $x=4$.

4) Use a triple integral to find the volume of the solid enclosed by the cylinder $x^2 + y^2 = 9$ and the planes $y + z = 5$ and $z = 1$. [Hint: use polar coordinates after integrating with respect to z]

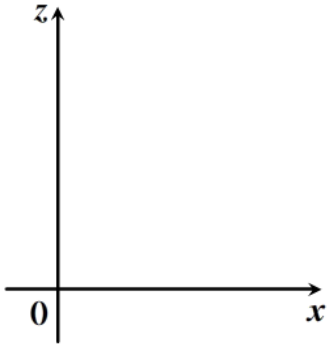
5) **Express** the iterated integral $\iiint_E dV$, where E is the solid drawn below, draw the projections of the solid onto each of the coordinate planes to aid you in expressing the following iterated integrals. **Do not solve the iterated integrals**.



xy-plane

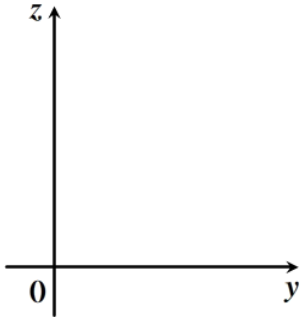


xz-plane



yz-plane

[Hint: 2 regions on this projection]



a) $\iiint_E dy\,dx\,dz$

b) $\iiint_E dz\,dx\,dy$

c) $\iiint_E dz\,dy\,dx$

d) $\iiint_E dy\,dz\,dx$

e) $\iiint_E dx\,dy\,dz$

f) $\iiint_E dx\,dz\,dy$

6) Find the moments of inertia for a cube of constant density k and side length L if one vertex is located at the origin and three edges lie along the coordinate axes.

7) The joint density function for random variables X, Y, and Z is:

$$f(x,y,z)=\begin{cases} Cxyz & \text{if } 0\le x\le 2,\ 0\le y\le 2,\ 0\le z\le 2 \\ 0 & \text{otherwise} \end{cases}$$

a) Find the value of the constant C.
b) Find $P(X\le 1,\ Y\le 1,\ Z\le 1)$
c) Find $P(X+Y+Z\le 1)$