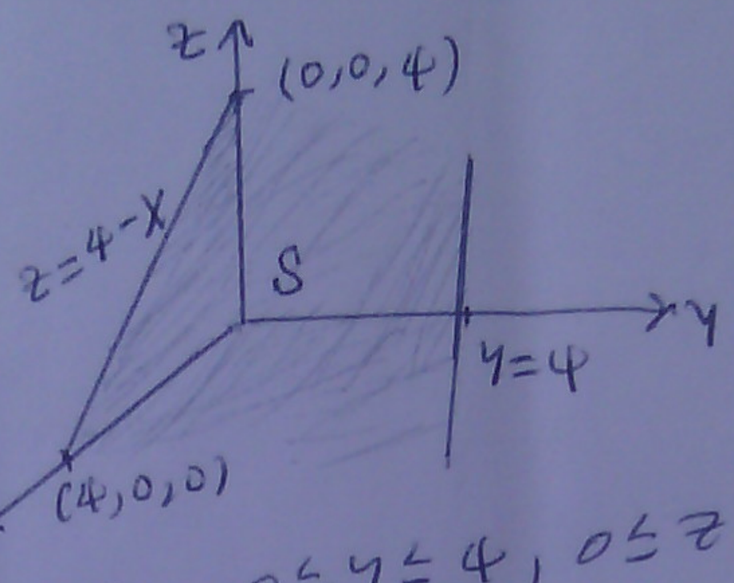
5. Use **Gauss Divergence Theorem** to evaluate $\iint_S F \cdot N ds$, where $F(x,y,z) = xyi + zj + (x+y)k$,

where S: surface bounded by planes $y = 4,\ z = 4 - x$ and coordinate planes.



$Q = \{(x,y,z) : 0 \le x \le 4,\ 0 \le y \le 4,\ 0 \le z \le 4-x\}$ (1)

$P = x+y$

$N = z$,

$M = xy$, where

$div F = Mx + Ny + Pz$,

$= y + 0 + 0$

$= y$ (1)

surface integral

$\iint_S F \cdot N dS = \iiint_Q div F \, dV$ (1)

$= \int_0^4 \int_0^4 \int_0^{4-x} y \, dz \, dx \, dy$ (1)

$= \int_0^4 \int_0^4 yz \Big|_0^{4-x} dx \, dy$

$= \int_0^4 \int_0^4 y(4-x) \, dx \, dy$

$= \int_0^4 y\left(4x - \frac{x^2}{2}\right)\Big|_0^4 dy$

$= \int_0^4 y(8) \, dy$

$= 8\frac{y^2}{2}\Big|_0^4$

$= 64$ (1)