Multivar Exam #1 Saaif Ahmed PG 1

Honor Pledge:

"I have neither given nor received any illegal aid on this exam"

-Saaif Ahmed 9/30/20

Problem 2:

Use double integrals to compute the volume contained in the first octant, $x \geq 0$ $y \geq 0$, $z \geq 0$ under the plane $x + y + z = 1$.

Bounded by points (1,0,0) , (0,1,0) , (0,0,1)

$x + y + z = 1$

$z = 1 - x - y$

Thus $0 \leq x \leq 1$, $0 \leq y \leq 1 - x$

$$\int_0^1 \int_0^{1-x} (1 - x - y)\ dydx$$

$$\int_0^1 (1 - x)y\ - \frac{1}{2}y^2 \Big|_0^{1-x}\ dx$$

$$\int_0^1 \left(x^2 - 2x - \frac{(1-x)^2}{2} + 1\right) dx$$

$$\frac{1}{3}x^2 - x^2 + x - \frac{1}{6}(x+1)^3 \Big|_0^1 = \frac{1}{6}$$

Answer: $\frac{1}{6}$