

This test consists of 5 questions with the point value for each problems is in the parenthesis. Please show all of the necessary steps.

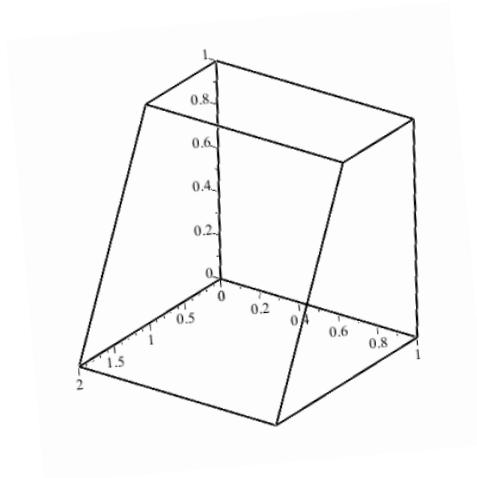
1. (10) Reverse the order of integration and integrate showing your steps.

$$\int_0^1 \int_{\sqrt{y}}^1 \frac{3 \, dx \, dy}{1 + x^3}$$

2. (10) Find the volume bound by the paraboloid $z = 2 - x^2 - y^2$ and the cone $z = \sqrt{x^2 + y^2}$

3. (8) Find the limits of integration of the triple integral where the volume is bound by $x = 0, y = 0, y = 1, z = 0, z = 1$, and $z = 2 - x$. The picture of the volume is below.

$$\iiint_V f(x, y, z) dV$$



4. (10) Find the limits of integration of the triple integral in both cylindrical and spherical coordinates where the volume is bound by the cone $z = \sqrt{x^2 + y^2}$ and the plane $z = 1$. DO NOT EVALUATE.

$$\iiint_V x y z dV$$

5. (12) Classify the critical points for $z = x^2y - x^2 + y^2 - 18y$.