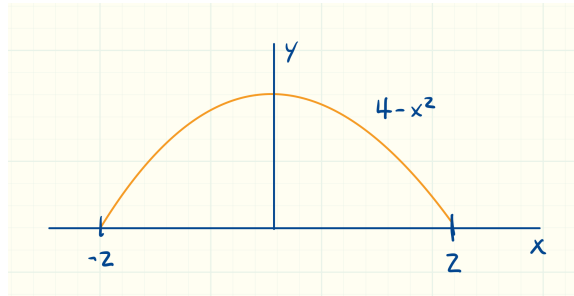


Name:

1. Let \mathcal{E} be the 3-d region bounded determined by the inequalities $0 \leq z \leq 3x$ and $0 \leq y \leq 4 - x^2$. The figure below might help with visualizing the region.



- a. Write down an iterated integral in terms of x , y and z variables that is equivalent to

$$\iiint_{\mathcal{E}} z \, dV.$$

Your innermost integral should be with respect to z , and the middle integral should be with respect to y . Do NOT compute the value of the integral.

- b. For the integral you just wrote down, compute the two innermost integrals (i.e. with respect to z and then y) to reduce the triple integral to a single integral with respect to x . Do NOT further compute the value of the integral.

2. Rectangular coordinates (x, y, z) can be written in terms of spherical polar coordinates (ρ, θ, ϕ) . Simply write down what these formulas are. I.e, $x =$ stuff involving ρ , θ and ϕ and so forth.

3. Let \mathcal{E} be upper half sphere $\{(x, y, z) \mid x^2 + y^2 + z^2 \leq 4\}$ of radius 2 with $z \geq 0$. Write the integral

$$\iiint_{\mathcal{E}} z^2 - x^2 - y^2 \, dV$$

in terms of spherical polar coordinates (ρ, θ, ϕ) . Simplify the integrand to the extent possible, but do NOT compute the value of the integral.