1 The rooftop

(a) A building is 8 meters wide and 16 meters long. It has a flat roof that is 12 meters high at one corner, and 10 meters high at each of the adjacent corners. What is the volume of the building?
HINT: Find an equation for the roof, then answer the question.

(b) You are making a scale model of this building, with 1 centimeter on the model corresponding to 1 meter on the building. Your model will be made of gooey clay, which tends to settle, and is therefore denser at the bottom than the top. The density of clay in your model is in fact given by $2 - \frac{z}{12}$ grams per centimeter (g/cc). How much clay do you need to make your model?
HINT: What sort of an integral do you need?
Set up but do not evaluate this integral.

2 The solid cone

Let W be the solid cone bounded by $z = \sqrt{x^2 + y^2}$ and $z = 2$. For each integral below, decide *without calculating its value* whether the integral is positive, negative, or zero. *Explain your reasoning!*

(a) $\displaystyle\int_W (z - \sqrt{x^2 + y^2})\, dV$

(b) $\displaystyle\int_W y\, dV$

3 Order of integration

Evaluate $\displaystyle\int_0^1 \int_y^1 e^{x^2}\, dx\, dy$

HINT: Reverse the order of integration.

4 The Cake (wrapup)

After completing the Cake Activity, answer the following question. Justify your answers, using complete sentences.

The cake's caloric density is given by $\rho(x, y, z) = \frac{10}{\sqrt{z}} \frac{cal}{in^3}$ (Heavy ingredients like chocolate chips and nuts can settle during baking.) How many calories are in your largest piece of cake?