

College of the Holy Cross, Spring Semester, 2021

Math 241 (Professor Hwang)

Introduction, Regions in Space, Activity 1

Welcome to Multivariable Calculus! Today is a high-level overview of the course, with activities so you can meet your classmates. The activities are based on developing your intuition for qualitative properties of three-dimensional structures.

Ninety-eight cubes of vegetable or animal (apologies to fellow vegans and vegetarians among you) are shown. A larger version is at <https://www.boredpanda.com/raw-food-cubes-lernert-sander-volkskrant/>

**Exercise 1.** Each part concerns the qualitative structure of the cubes.

- (a) Identify pieces with *boundary*, i.e., a skin or rind.
- (b) Identify pieces that appear to be made up of a “stack of layers” (below left).
- (c) Identify pieces that appear to be made up of a “bundle of fibers” (below right).
- (d) For the cubes in (b), identify those that are made of approximately concentric spherical shells. (*Concentric* = same center.)
- (e) For the cubes in (b), identify pieces that are made of coaxial cylindrical shells. (*Coaxial* = same axis.)
- (f) Identify pieces that show longitudinal sections of a structure with rotational symmetry. (*Longitudinal* = in a plane containing an axis of rotation.)
- (g) How many cubes are you able to identify on your own? Are there cubes you can't even remotely identify? (There is an annotated version at Bored Panda; please don't look at it until class is over.)



