(1) Using what we’ve learned about vector geometry, determine the angle between a diagonal of a cube (i.e. a line joining opposite vertices and passing through the center of the cube) and one of its edges. What if we double one dimension of the cube? (i.e. instead of 1 x 1 x 1, the dimensions are 1 x 1 x 2).

(2) What is wrong with the following statements? Explain why they are false and modify them to be correct in all cases.
   (a) A plane is determined by its normal direction.
   (b) Given a vector, \( \vec{v} \neq \mathbf{0} \), and the numbers \( \vec{v} \cdot \vec{w} \) and \( \| \vec{w} \| \), we can determine \( \vec{w} \).
   (c) If \( \vec{v} \times \vec{w} = \mathbf{0} \), then one of the vectors must be zero.
   (d) There is exactly one unit vector parallel to a given nonzero vector.

(3) This is an exercise to get you thinking in dimensions higher than 3. It’s not as scary as it sounds!
   Two general lines in a plane intersect in a point (i.e. in 2 dimensions, a 1-dimensional object and a 1-dimensional object intersect in a 0-dimensional object.)
   Two general planes in space intersect in a line (i.e. in 3 dimensions, a 2-dimensional object and a 2-dimensional object intersect in a 1-dimensional object.)
   A general plane and a general line in space intersect in a point (i.e. in 3 dimensions, a 2-dimensional object and a 1-dimensional object intersect in a 0-dimensional object.)

   From these examples, formulate a rule for a general intersection of an object of dimension \( a \) and an object of dimension \( b \) in \( n \)-dimensional space. In particular, what does the rule say about intersecting two planes in 4-dimensional space? (Hint: You should think about what happens with the codimensions; an object of dimension \( a \) in \( n \)-dimensional space has codimension \( n - a \). Roughly, codimension counts how many directions there are to leave your object.)