

18.06 Problem Set 1

Due Wednesday, 10 September 2008 at 4 pm in 2-106.

Problem 1: Do problem 25 from section 1.2 in the book.

Problem 2: Do problem 29 from section 1.2.

Problem 3: Do problem 5 from section 2.1.

Problem 4: Do problem 13 from section 2.2.

Problem 5: Do problem 26 from section 2.2.

Problem 6: Do problem 30 from section 2.3.

Problem 7: Do problem 35 in section 2.4

Problem 8:

1. In three dimensions the set of all vectors perpendicular to $(1,1,1)$ form 1) a line 2) a plane 3) a point 4) all of 3d.
2. Draw a cube with eight vertices $(\pm 1, \pm 1, \pm 1)$ There are twelve edges each with a midpoint. How many of the vectors from the origin to the midpoints are perpendicular to $(1,1,1)$?
3. Investigate the cosine of angles of “consecutive” midpoints (your job is to figure out what consecutive here must mean!)
4. Optional: What figure is formed from these midpoints?

Problem 9: In your computational environment set up a 4 x 4 matrix A of your own choice. In succession reset the upper left element of A to be 1, 2, 3, 4, etc and compute the determinant. (Many packages have commands such as $\det(A)$ or $\text{Det}[A]$ (Mathematica) or $\text{Determinant}(A)$ (Maple[LinearAlgebra])). For example, $A(1,1)=1$, $\det(A)$, $A(1,1)=2$, $\det(A)$, $A(1,1)=3$, $\det(A)$, etc. What can you say about the successive determinants?

Now compute the upper left element of $\text{inv}(A)*\det(A)$ (inverse times determinant, which may have slightly different names in different languages). What can you say about the sequence of upper left elements as we run through 1,2,3,4 in the upper left of A? For example, $A(1,1)=1$, $B=\text{inv}(A)*\det(A)$, $B(1,1)$, $A(1,1)=2$, $B=\text{inv}(A)*\det(A)$, $B(1,1)$, $A(1,1)=3$, $B=\text{inv}(A)*\det(A)$; $B(1,1)$.

N.B. If you run into a matrix that has no inverse (or is computationally near a matrix with no inverse), you might have difficulties: large numbers, infs, or NaNs ("Not a Number") depending on the package. Probably easiest to change one number in your matrix and these difficulties should disappear.