October 2

Announcements

- Watch 2nd and 3rd 3blue1brown videos
- Section 1.1, 1.2 due this Thursday
- Worksheet 1 due Friday
- Section 2.1, 2.2 due next Thursday
- Office hours in Padelford C-8D
  - Wednesday 4:30 - 5:30
  - Thursday 12:00 - 1:00

Continue from last class

Justify the elementary row operations in class.

Gaussian elimination

Definition: The *pivot positions* are positions that contain a leading term. The *pivot columns* are columns that contain a pivot position. A *pivot* is the value of a *pivot position.*

Algorithm: *Gaussian elimination* is performed as follows: * find the pivot position in the first row * use elementary row operators to eliminate all value under the pivot position * continue

work out example in class

Reduced echelon form

Definition: A matrix is in *reduced echelon form* if * it is in echelon form * all pivot positions contain a 1 * the only nonzero term in a pivot colum is in the pivot position

Algorithm: *Gauss-Jordan elimination* is performed as follows: * do Gaussian elimination * divide each row by the value of its pivot * eliminate all other values in pivot column.

work out example in class.

Homogenous linear systems

A linear system is homogenous if the numbers to the right of the equal sign are all zero. They always have the trivial solution

2.1 Vectors

A vector is a list of number with addition and scalar multiplication defined. Given vectors $u = (u_1, u_2, \ldots, u_n) \in \mathbb{R}^n$, $v = (v_1, v_2, \ldots, v_n) \in \mathbb{R}^n$ of equal dimension and a scalar $c \in \mathbb{R}$, we define * addition: $u + v = (u_1 + v_1, u_2 + v_2, \ldots, u_n + v_n)$, * scalar multiplication: $cu = (cu_1, cu_2, \ldots, cu_n)$.

go over the geometry in class. tail to tip, parallelogram

Let a, b be scalars and $u, v, w \in \mathbb{R}^n$. Then * $u + v = v + u$, * $a(u + v) = au + av$, * $(a+b)u = au+bu$, * $(u+v)+w = u+(v+w)$, * $a(bu) = (ab)u$, * $u+(-u) = 0$, * $u + 0 = 0 + u = u$, * $1u = u$.

Definition: The If $u_1, u_2, \ldots, u_m$ are vectors and $c_1, c_2, \ldots, c_m$ are scalars, then

$$c_1u_1 + c_2u_2 + \ldots + c_mu_m$$

is a *linear combination* of $u_1, \ldots, u_m$. Note that the constants can be negative or zero.

give examples in class.