

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 column 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 $u = (u_1, u_2, \dots, u_n) \in \mathbb{R}^n$, $v = (v_1, v_2, \dots, v_n) \in \mathbb{R}^n$ of equal dimension

and a scalar $c \in \mathbb{R}$, we define * addition: $u + v = (u_1 + v_1, u_2 + v_2, \dots, u_n + v_n)$,
 * scalar multiplication: $cu = (cu_1, cu_2, \dots, cu_n)$.

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, \dots, u_m are vectors and c_1, c_2, \dots, c_m are scalars, then

$$c_1u_1 + c_2u_2 + \dots + c_mu_m$$

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

give examples in class.