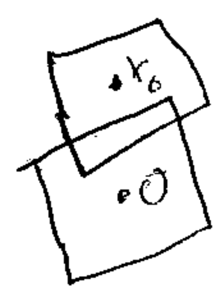
Geometry of linear Systems

Let A be $m \times n$ real matrix
let $a_1, \ldots, a_m$ be the rows
Then $Ax = 0 \iff a_1 \cdot x = 0$ and $a_2 \cdot x = 0$
and ... and $a_m \cdot x = 0$
$\iff x$ is orthogonal (normal)
to $a_1, \ldots a_m$)

Solving $Ax=0$ (e.g. by Gaussian elimination)
gives a parametric form for this set
of solutions

$$t_1 u_1 + \ldots + t_s u_s$$

The set of solutions to $Ax=b$
is the translate of the set of solutions
to $Ax=0$ by any solution x_0 to $Ax=b$
ie. $A(x-x_0)=0$ iff $Ax=b$
if $Ax_0 = b$



Cross Product $\mathbb{R}^3$

v, w vectors in $\mathbb{R}^3$ (AKA 3 space)

$$v = (v_1, v_2, v_3) \quad w = (w_1, w_2, w_3)$$

$$v \times w = \left(\begin{vmatrix} v_2 & v_3 \\ w_2 & v_3 \end{vmatrix}, -\begin{vmatrix} v_1 & v_3 \\ w_1 & w_3 \end{vmatrix}, \begin{vmatrix} v_1 & v_2 \\ w_1 & w_2 \end{vmatrix} \right)$$