APSC 174

monday january 9th

example

$2x_1 - 3x_2 + \pi x_3 = -10$ → linear

$3x_1 + x_2 + 0 \cdot x_3 = 2$ → linear

$2x_1 - 3\boxed{x_1 x_2} + 6x_3 = 8$ → non-linear

not a constant multiple

$x_1 + \cos(x_2) = 7$ → non linear

examples of systems   m: # of eqn's   n: # of unknowns

$\{5x_1 = 4$ 1   1

$\begin{cases} 2x_1 + x_2 = 1 \\ -x_1 + x_2 = 0 \end{cases}$ 2   2

$\begin{cases} 3x_1 + 2x_2 = -1 \\ -x_1 + 4x_2 = 0 \\ 2x_1 + x_2 = 10 \end{cases}$ m=3   n=2

$\begin{cases} x_1 + 2x_2 + x_3 = 7 \\ 3x_1 - x_2 - 3x_3 = 6 \end{cases}$ 2   3

in general, $m \neq n$

Objective: solve for the unknowns $x_1, x_2 \ldots x_n$ which satisfy all linear equations in the system simultaneously

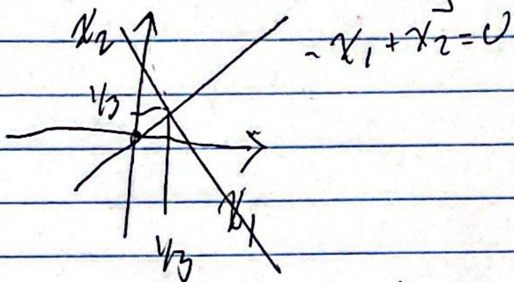
Number of solutions to system:

ex.

$(m = n = 2)$

i) $\begin{cases} 2x_1 + x_2 = 1 \\ -x_1 + x_2 = 0 \end{cases}$ $\quad x_1 = x_2 = \frac{1}{3}$

geometrically we are determining the intersection



$\boxed{x_2 = 1 + x_1}$

ii) $\begin{cases} -x_1 + x_2 = 1 \\ 2x_1 - 2x_2 = -2 \end{cases}$

They describe the same line, infinite solutions

iii) $\begin{cases} -x_1 + x_2 = 1 \\ -x_1 + x_2 = 2 \end{cases}$ requires $\left.\begin{matrix} x_2 = 1 + x_1 \\ \& \\ x_2 = 2 + x_1 \end{matrix}\right\}$ impossible

no solution

Scanned with CamScanner