Linear Systems

# Introduction

A linear system is fundamentally a {set} containing one or more linear equations which prove true to the same {set} of solutions.

The system can be represented using matrices, which is a helpful data structure for visualizing and operating on linear equations.

For example, say you have the set of equations:  
,   
then we can rewrite it as:  
, by taking just the *coefficients* of the original equations  
which in terms of algorithmic analysis and programming is much cleaner and representable as a structure.  
  
The objective is to find the solutions to these equations, which we can represent as *tuples* of numbers . The solution for the example would be .

To establish some technical terms as we go:   
A matrix with the same number of rows as columns is called a *Square Matrix*;  
A matrix associated with a linear system whose equations all equal `0` (zero), like the one in the example, is called a *Homogenous Matrix*