Ay190 – Worksheet 8
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# 1 Linear System of Equations

## 1.1 The data

I have written functions which load in a matrix and determines if it is a square invertable matrix. Even if it does not satisfy these conditoins the funciton returns the matrix, as well as printing its size. I also have written a function which loads in vectors, returns them as well as printing their size.

## 1.2 My Gauss Elimination

I found a Gauss Elimination script on the internet. I have modified it to take advantage of the numpy array functionality. This has provided a 55x speed up over the original implementation for the 1000x1000 matrix.

In order to gauge the time it took more accurately (accounting for other processes changing over time) I ran multiple runs; 5 trials for all except the smallest matrix which went so quickly that 500 runs were required to get an accurate measure. I found that the my Gauss elimination method took $(0.00164, 0.138, 0.56, 18.148, 88.07)$ for each of the matricies $(10, 100, 200, 1000, 2000)$ respectively.

## 1.3 Numpy Solver

The Numpy linalg uses the LAPACK routine_gesv to compute the solution. When running the Numpy solver I found it was much quicker and thus required more trials to accurately measure its speed. I ran 1000 trials for the matricies of dimension 10, 100, and 200; 100 trials for the 1000 and 2000 row matrix. I found that it took $(9 * 10^{-5}, 1.22 * 10^{-3}, 5.82 * 10^{-3}, .5007, 3.63)$ seconds to complete for the $(10, 100, 200, 1000, 2000)$ matricies respectively.