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Matrices and Vectors

Matrices are 2-dimensional arrays:

```
egin{bmatrix} a & b & cd & e & fg & h & ij & k & l \end{bmatrix}
```

The above matrix has four rows and three columns, so it is a 4 x 3 matrix.

A vector is a matrix with one column and many rows:

```
[wxyz]
```

So vectors are a subset of matrices. The above vector is a 4 x 1 matrix.

Notation and terms:

- ullet A_{ij} refers to the element in the ith row and jth column of matrix A.
- A vector with 'n' rows is referred to as an 'n'-dimensional vector.
- v_i refers to the element in the ith row of the vector.
- In general, all our vectors and matrices will be 1-indexed. Note that for some programming languages, the arrays are 0-indexed.
- Matrices are usually denoted by uppercase names while vectors are lowercase.
- "Scalar" means that an object is a single value, not a vector or matrix.
- ullet R refers to the set of scalar real numbers.
- \mathbb{R}^n refers to the set of n-dimensional vectors of real numbers.

Run the cell below to get familiar with the commands in Octave/Matlab. Feel free to create matrices and vectors and try out different things.

```
\ensuremath{\mathrm{\%}} The ; denotes we are going back to a new row.
        A = [1, 2, 3; 4, 5, 6; 7, 8, 9; 10, 11, 12]
        % Initialize a vector
        v = [1;2;3]
   6
        \% Get the dimension of the matrix A where m = rows and n = columns
   8
        [m,n] = size(A)
        % You could also store it this way
  10
  11
        dim_A = size(A)
  12
        \% Get the dimension of the vector \boldsymbol{v}
  13
  14
        dim_v = size(v)
  15
  16
        % Now let's index into the 2nd row 3rd column of matrix A
  17
        A_23 = A(2,3)
                                                                                            Run
  18
                                                                                           Reset
              6
        11
   10
             12
dim A =
dim_v =
  3
      1
```