

# Matlab Review

## Scalars, Vectors, and Matrices

```
>> s = 7.3 % A scalar, represented as [7.3]
>> v = [1 2 3 4] % Row vector
>> u = [5 6 7 8 9]' % Column vector
>> z = [10, 11, 12]; % Notice use of commas and ; (semicolon)
>> str = 'hola mundo' % A string is an array of characters
```

### % Matrices

```
>> A = [1, 2, 3; 4, 5, 6]; % A 2x3 matrix.
>> B = [0, 2, 4, 6; ... % Notice ...
       7, 8, 9, 10; ...
       8, 12, 14, 16]; % A 3x4 matrix
>> A*B % Matrix product
>> unos = ones(2,3); % A 2x3 matrix of ones
>> ceros = zeros(3,4); % A 3x4 matrix of zeroes.
>> identity = eye(6); % A 6x6 identity matrix.
>> R = rand(4); % A 4x4 matrix of uniform random numbers.
>> Rn = randn(2,3); % A 2x3 matrix of normal (standard) numbers.
>> D = diag([1, 2, 3]); % A 3x3 diagonal matrix, whose diag values
                        % are given.
```

### Exercise:

If rand generates a matrix with values in (0,1); how can generate values in a given range of integers, like [1,6]?

```
>> A = rand(2,3)
>> B = 1 + round(A*5) % also floor and ceil
```

### % More operations

```
>> A * z'
>> v + [1 z] % Embedding an array in another.
>> v(1, 1:3) + z % Slicing
>> A * v(1, 1:3)'
>> A ./ Rn % Element-wise operations
>> A ./ Rn
>> sqrt(R)
>> R^4 % Matrix exponentiation
>> R.^4
```



>> A/2 == A./2      % True (1)  
 >> 2\*A              % Same as A\*2  
 >> inv(R)            % Inverse of R  
 >> det(R)            % Determinant

### Exercise

How do we find the inverse of a matrix? A 2x2 Matrix

Let  $\delta$  be the determinant, then

$$A = \begin{bmatrix} a & b \\ c & d \end{bmatrix} \quad A^{-1} = \frac{1}{\delta} \begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$$

% Some statistics metrics

>> sum(A)  
 >> sum(A,1)      % Summing through the rows  
 >> sum(A,2)      % Summing through the columns.  
 >> mean(A)  
 >> std(A)  
 >> var(A)

### Exercise

- Given a vector  $v$ , how do you sum its values without using "sum"?
- Can you compute  $\text{sum}(A,1)$  of matrix  $A$  without using "sum"?
- How do you compute the sum of all elements in the matrix?
- Compute the mean and variance of all elements in a matrix.

>> A = magic(6)  
 >> A > 10      % Show 1's where the element is > 10.  
 >> find(A > 10)      % Yields a vector of locations where the condition is met.

### Exercise

How do we assign 100 to a matrix element where its value is larger than 10, and give zeros everywhere else?

>> A(A > 10) = 100  
 >> A(A ~ 100) = 0



## Plotting

```
>> t = linspace(0, 6*pi, 600);  
>> x = cos(t);  
>> y = sin(t);  
>> z = t;  
>> figure; % Creates a window.  
>> plot3(x, y, z, 'b-', ...  
        'Marker', 'x', ...  
        'LineWidth', 2, ...  
        'MarkerSize', 10, ...  
        'MarkerFaceColor', [1 0 1]);  
>> axis equal  
>> xlabel('x axis');  
>> ylabel('y axis');  
>> zlabel('z axis');  
>> legend('Spiral');  
>> title('Drawing');
```

## Functions

Show the function to  
compute square and  
cubic matrix.

## Exercise:

Write a function to draw a circle of radius  $r$ .