Homework One

clc; close all; clear all;

Problem 1.1 (Vectors)

```
x = [1i, 0, 1]; y = [1, -1, 2j];
% (a) Calculate the length of x and y
fprintf('The length of x is %01.2f and y is %01.2f', norm(x), norm(y));
```

```
The length of x is 1.41 and y is 2.45
```

```
% (b) Inner products
fprintf(['The inner products are conugate identical. \n'...
         '<x, y> = %01.1f + %01.1fj; <y, x> = %01.1f + %01.1fj.'], ...
        dot(x,y), imag(dot(x,y)), dot(x,y), imag(dot(y,x)));
```

```
The inner products are conugate identical.
<x, y> = 0.0 + 1.0j; <y, x> = 0.0 + -1.0j.
```

```
% (c) Give an example of a vector orthogonal to x and y
a = sym('a'); b = sym('b');
V = [a, b, 1];
[a, b] = solve([0; 0] == [dot(x,V); dot(y,V)], [a, b]);
V = [a, b, 1]
```

$$v = \begin{pmatrix} -i & -3i & 1 \end{pmatrix}$$

```
[dot(x, V), dot(y,V)]
```

$$ans = \begin{pmatrix} 0 & 0 \end{pmatrix}$$

Matrix Multiplication

(a) Write out by hand

(b) Write out by hand

1

```
% (c)
A  = [1, 1, 1; 1, -1, 1; -1, -1, 1];
B  = [1, 2, 1; 0,  3, 1;  0,  0, 1];
A*B
```

```
ans = 3x3
     1     5     3
     1    -1     1
    -1    -5    -1
```

```
B*A
```

```
ans = 3x3
     2    -2     4
     2    -4     4
    -1    -1     1
```

This tells us matrix multiplication is not commutitive.

Matrix calculations

```
A = [1, 1, 1, 1; 1, -1, 1, -1; 1, 1, -1, -1; 1, -1, -1, 1];
trace(A);
det(A) % By hand, break into successive minors until 2x2
```

```
ans = 16
```

```
eig(A) % As defined on the review sheet
```

```
ans = 4x1
    -2
    -2
     2
     2
```

```
[V, ~] = eig(A)
```

```
V = 4x4
         0   -0.5000    0.2887   -0.8165
   -0.7071    0.5000   -0.2887   -0.4082
    0.7071    0.5000   -0.2887   -0.4082
         0    0.5000    0.8660         0
```