MATLAB Command Summary Sheet

Addition/Subtraction/Multiplication/Division Matrix and Vector Operations

We can add or subtract matrices and vectors using the addition/subtraction operation. Ex.

`A + B - C`

This does element by element addition on the matrices/vectors, A, B, and C.

Element-by-Element multiplication, division, and exponentiation
This is accomplished by placing a `.' in front of the operator command. Ex.

`A .* B`
`A .^ 2`

Note that typing `A*B` does the standard matrix-matrix multiplication. In general, this will not equal typing `A .* B`.

Solving the Equation A*x = b.
Most numerical problems can be reduced to solving a system of linear equations in the form, A*x = b, where we are given a matrix A and a vector b, and we need to find the vector x. x can be found in MATLAB by typing the command

`x = A\b`

Accessing columns/rows/sub-matrices of a Matrix
If we want to access the 2nd column of a matrix A, we type the command

`A(:,2)`

Similarly, if we want to access the 1st row of a matrix A, we type the command

`A(1,:)`

The colon in the above commands tells MATLAB to access all the elements in that field. We can also access ranges of elements using the colon operator.

`A(3:6,5:9)`

This accesses the elements in rows 3-6 and columns 5-9 and returns a matrix with dimensions 4x5.

Joining Matrices and Vectors
If we have a matrix A and a column vector b, and we want to add the column b to the right of matrix A, we use the command
» A = [A b]

If we have a matrix A and a row vector b, and we want to add the row vector b to the bottom of matrix A, we use the command

» A = [A; b]

Note that to add the row, we need to place a semicolon between A and b.

**MATLAB Functions**

The For Loop

```
FOR I = 1:N,
    FOR J = 1:N,
        A(I,J) = 1/(I+J-1);
    END
END
```

The If command

```
if I == J
    A(I,J) = 2;
elseif abs(I-J) == 1
    A(I,J) = -1;
else
    A(I,J) = 0;
end
```

The While Loop

```
while norm(E+F-E,1) > 0,
    E = E + F;
    F = A*F/N;
    N = N + 1;
end
```

An example of a function

```
function [mean, stdev] = stat(x)
%STAT Interesting statistics.
    n = length(x);
    mean = avg(x, n);
    stdev = sqrt(sum((x-avg(x,n)).^2)/n);
```
Useful Matrix/Vector Building Commands

Creating a matrix/vector with all the elements set to zero.

```matlab
» A = zeros(3,2)
A =
0 0
0 0
0 0
```

Creating a matrix/vector with all the elements set to one.

```matlab
» b = ones(3,1)
b =
1
1
1
```

Miscellaneous Commands

To obtain the transpose of a matrix or vector, place a `' after the matrix variable. Ex.

```matlab
» b
b =
1
1
1

» b'
ans =
 1    1
```

To sum the elements of a vector, use the `sum` command.

```matlab
» sum(b)
```

To find the mean of a vector, use the `mean` command.

```matlab
» mean(b)
```

To find the standard deviation of a matrix or vector, use the `std` command.

```matlab
» std(b)
```