Talked about **Script file vs Function**

**Script** - executes sequence of commands
**Function** - accepts one or more parameters (called arguments) and returns one or more values

MATLAB review

- if - then - else
- for loops
- `feval`
- `indir`

to make a decision to ask questions if

```matlab
if (condition is true)
    ==
    ~=
    >
    <
else
    ...
end
```

Also can use 'else if' construct to ask multiple questions
If ( condition )
    
else if ( condition2 )
else
end

if ( x <= 5 )
    \( \omega = \frac{5}{2.5} \)
elseif ( x < 10 )
    \( \omega = 10 \)
else
    \( \omega = 7.5 \)
end

\[ w(x) = \begin{cases} 
5 & 0 \leq x < 5 \\
10 & 5 \leq x < 10 \\
7.5 & 10 \leq x < 15 
\end{cases} \]

Repeat operations.
"for" loop
"while" loop
Syntax: for var = start : inc : finish
end
'var' is counter declaring number of loops.
'inc' is optional and if absent assumed to be 1

ex's:
for i = 1:10
    start = finish
end
    start = inc
end
for j = 100:1-5:10

"feval" - function evaluation - a "helper" function in Matlab allows a function name to be passed as argument to another function.
Suppose function 'fzero' finds the root of an arbitrary function.

function [root] = fzero(frame, ...) % a placeholder for function name
feval(frame, args)

"fzero" - function zero - a function in Matlab allows a function name to be passed as argument to another function.
inline - a method to define a (simple) function without writing in file

\texttt{function = inline('expression', var1, var2;}

\texttt{\hspace{1cm} e.g.}

\texttt{\hspace{1cm} \hspace{1cm} f(x) = inline('cos(x) * sin(x)'))}

\texttt{\hspace{1cm} \hspace{1cm} \hspace{1cm} f(x(\pi)) = \_ =}

Contrast this w/ .m file

\texttt{\hspace{1cm} \hspace{1cm} function [val] = \texttt{fx}(x;}

\texttt{\hspace{1cm} \hspace{1cm} val = \texttt{cos}(x) * \texttt{sin}(x); \hspace{1cm} \texttt{return}.

Chapter 7 - Linear Algebraic Equations

Matrices

Often in engineering analyses, end up with \( N \) equations with \( N \) unknown variables. Want to solve these:

\[ 5x + 3y = 6 \quad \text{2 eqns} \]

\[ -2x + 7y = 0 \quad \text{2 unkns} \]
Can represent in matrix form
\[ \begin{bmatrix} 5 & 3 \\ -2 & 7 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 6 \\ 0 \end{bmatrix} \]
a square matrix \( \text{number of rows} = \text{number of cols} \)

Columns vectors \( \rightarrow \) matrix with only 1 column.

Entries of matrix are called elements are indexed or addressed by row and column.

\([A]\) is a matrix

\(a_{ij}\) is the element at row \(i\), col \(j\)

Matlab
\(A(i,j)\) is the element at row \(i\), col \(j\)
The `size()` function in MATLAB returns the dimensions (number of rows and columns) of a matrix. For example:

\[ \text{size}(A) \rightarrow \text{returns a vector} \]

\[ [\text{rows}, \text{cols}] = \text{size}(A); \]

Add matrices - rows and cols must be the same for the two matrices:

\[ C = A + B \]

Matrix multiplication -

\[ C = A \times B \]

Where the number of columns in A must equal the number of rows in B:

\[ C_{ij} = \sum_{k=1}^{n} a_{ik} \times b_{kj} \quad n = \text{num cols in A} \]

\[ n = \text{num rows in A} \quad m = \text{num cols in B} \]
Matlab `error` statement

error('here a message to help user')