Chapter 5
Loops: while, for
Part 1
while Loop

- General form:
  
  ```
  while <Boolean expression>
  statement(s)
  end
  ```

```python
age = input('Enter age: ');
while age < 0
    age = input('Invalid! Enter a positive number: ');
end
```
for (counted) Loop

- General form:
  ```
  for loopvar = range
  statement(s)
  end
  ```

```for num = 1 : 5
  disp( num )
end```

Prints:
```
1
2
3
4
5
```
prod = 1;
for num = 1 : 3
    prod = prod * num
end

Prints:

prod = 1
prod = 2
prod = 6
If function call is: \( \text{product} = \text{mult}(1, 4) \)

```matlab
function [ prod ] = mult ( start, finish )
    prod = 1;
    for k = start : finish
        prod = prod * k
    end
```

Prints:
```
prod = 1
prod = 2
prod = 6
prod = 24
product = 24
```
for - Subplot

- If subplot matrix is 2 x 2, then loop through the 4 elements to produce the 4 separate plots

```
for k = 1 : 4
    subplot( 2, 2, k )
end
```

<table>
<thead>
<tr>
<th>Plot 1</th>
<th>Plot 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plot 3</td>
<td>Plot 4</td>
</tr>
</tbody>
</table>
for $j = 1:5$
   vec(j) = 0
end

Result of vec:

vec(1) = 0
vec(2) = 0
vec(3) = 0
vec(4) = 0
vec(5) = 0

Note: same as $\text{vec}(1:5) = \text{zeros}(1,5)$
for j = 1 : 5
    vec( j ) = j + j
end

Result of vec:

vec(1) = 2
vec(2) = 4
vec(3) = 6
vec(4) = 8
vec(5) = 10
for \( j = 1 : 5 \)
\[
\text{vec}( j ) = j + 1
\]

\[
\text{if } \text{vec}( j ) < 5 \\
\text{vec}( j ) = 1;
\]
end
end

Result of vec:

- vec(1) = 1
- vec(2) = 1
- vec(3) = 1
- vec(4) = 5
- vec(5) = 6
for \( j = 1 : 3 \)

\[
\text{mat}( : , j ) = [ j, j, j ]
\]

end

Result of mat:

<p>| | | |</p>
<table>
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<tr>
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<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>
for $j = 1 : 3$

    mat( j , : ) = [ j, j, j j ]

end

Result of mat:

```
1 1 1 1
2 2 2 2
3 3 3 3
```
for k = 1 : 4
    mat( k , : ) = [ k-1, k ]
end

for k = 1 : 4
    mat( : , k ) = [ k-1, k ]
end