Week 5 Tutorial 3

The purpose of this tutorial is to demonstrate the usage of logical vectors and control structures.

```
% Always clear workspace variables before a new tutorial or program.
clear
clc
```

Edit the code below and update the variable named **name** with your name for this tutorial in the code below.

```
name="";
fprintf("Output for Tutorial_05_3 run by %s.\n", name)
```

Review If With Scalars

Here's a little review on If statements with scalar values

```
format compact  % Unformatted ouput will not have blank lines added

x=0
y=1
z=50

% An if statement with a scalar expression is true if the scalar has any
% non-zero value
if (x)  % false since x = 0
    disp('x is true')
else
    disp('x is false')
end

if (y)  % true since y ~= 0
    disp('y is true')
else
    disp('y is false')
end

if (z)  % true since z ~= 0
    disp('z is true')
else
    disp('z is false')
end
```

If With Vectors

Luckily, if statements work exactly the same with vectors as they do with scalars. With vectors however, if **any** value in the vector is zero, the result will be false, if there are no zero values in the vector, the result is true.

```
vectorA = [10, 20, 30, 40, 50]
vectorB = [10, 0, 30, 40, 50]
```

```
if (vectorA)  % true since vectorA has no elements = 0
    disp('vectorA is true.')
else
    disp('vectorA is false.')
end

if (vectorB)  % false since at least one element of vectorA is 0
    disp('vectorB is true.')
else
    disp('vectorB is false.')
end

if (vectorA == vectorB)  % false since not all elements are equal
    disp('vectorA == vectorB is true.')
else
    disp('vectorA == vectorB is false.')
end

if (vectorA ~= vectorB)  % false since not all elements are unequal
    disp('vectorA ~= vectorB is true.')
else
    disp('vectorA ~= vectorB is false.')
end
```

Using the `all()` function is equivalent to comparing two vectors. To determine if all values in vectorA match vectorB.

```
if all(vectorA == vectorB) % false since all values are not equal
    disp('All values in vectorA and vectorB are equal')
else
    disp('Not all values in vectorA and vectorB are equal')
end
```

It should be noted that, when using `all()` it is not only checking the set of all numbers in the two vectors, it is also checking the order.

```
x=0:1:10
y=10:-1:0
if all(x == y) % false since not all elements are unequal
    disp('All values in the vectors are equal')
else
    disp('Not all values in the vectors are equal')
end
```

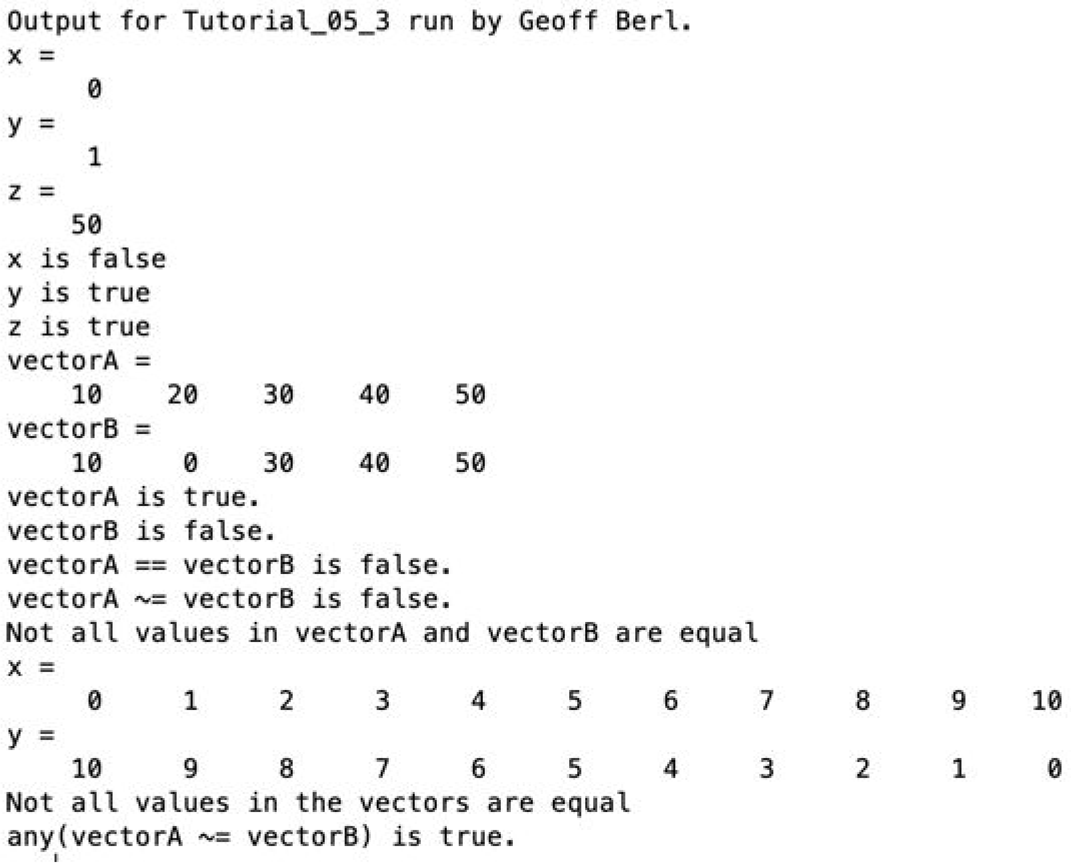
If we want to see if **any** values (in their respective positions) match between two vectors, we can use the `any()` function.

```
% true, since the position of 5 is the same for both vectors
if (any(vectorA ~= vectorB))
    disp('any(vectorA ~= vectorB) is true.')
```

```
else
    disp('any(vectorA ~= vectorB) is false.')
end
```

Example output

If you were to run your tutorial (enter **Tutorial_05_03** into the command window) your output should appear as follows.



```
Output for Tutorial_05_3 run by Geoff Berl.
x =
     0
y =
     1
z =
    50
x is false
y is true
z is true
vectorA =
    10    20    30    40    50
vectorB =
    10     0    30    40    50
vectorA is true.
vectorB is false.
vectorA == vectorB is false.
vectorA ~= vectorB is false.
Not all values in vectorA and vectorB are equal
x =
     0     1     2     3     4     5     6     7     8     9    10
y =
    10     9     8     7     6     5     4     3     2     1     0
Not all values in the vectors are equal
any(vectorA ~= vectorB) is true.
```

Additional Notes:

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