

MATLAB Marina: Logic Expressions

1. Create the MATLAB program of Figure 1 using the MATLAB editor. Execute the program and verify that the results of the logic expression are false, false, and true for values of number being less than zero (such as -2), zero, and greater than zero (such as 5) respectively. MATLAB uses the value of 1 for true and 0 for false.

```
clear; clc;
number = input('Enter a number: ');
result = (number > 0);
fprintf('number greater than zero: %d\n',result);
```

Figure 1. MATLAB Program for Exercise 1

2. Create the MATLAB program of Figure 2 using the MATLAB editor. Execute the program and verify that two plots for $0 \leq t \leq 1$ s and $0 \leq t \leq 0.5$ s are generated. Note the interval used for the variable `tt` in this example is not small enough for the sinusoid to be smooth.

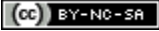
```
clear;
clc;
close all;
tt = 0.0 : 0.1 : 1.0;
xx = cos(2*pi*tt);
loc = (tt <= 0.5);
figure(1)
plot(tt, xx)
figure(2)
plot(tt(loc), xx(loc))
```

Figure 2. MATLAB Program for Exercise 2

3. Write a MATLAB program that will read in a number from the user and determine if the number is a positive number. The `input` function can be used to read in a number. Verify the program operates correctly by testing it for values of 5, -3, and 0.
4. Write a MATLAB program that will read in a number from the user and determine if the number is greater than zero and less than or equal to 100. Verify the program operates correctly by testing it for values of 50, 100, 105, and 0.
5. Write a MATLAB program that will read in a number from the user and determine if the number is an odd number. MATLAB's `mod` function can be used to determine if a number is divisible by two.
6. Write a MATLAB program that will:
 - a) Create a 1D array named `v` containing 50 values linearly spaced from 0.0 to 1.0.

- b) Determine which values in the array v are greater than 0.25 and less than 0.75. The result should be an array of logicals.
 - c) Determine which values in the array v are greater than 0.25 and less than 0.75. The result should be an array of indices.
7. Write a MATLAB program that will:
- a) Create a 1D array named wind of wind speeds in mph with the values 29, 7, 13, 3, 16, 18, 22, 5, 6, 10, 8, 12, 14, 3, 2, 10, 12, 20, 0, 15.
 - b) Determine which wind speeds are greater than or equal to 10 mph. The result should be an array of logicals.
 - c) Determine the speeds for the wind speeds greater than or equal to 10 mph. The result should be an array of speeds and can be determined using the result from b).
 - d) Determine which wind speeds are less than 5 mph. The result should be an array of indices.
 - e) Determine the number of wind speeds less than 5 mph. The result should be a scalar integer and can be determined using the result from d).
 - f) Determine which wind speeds are greater than 5 mph and less than or equal to 15 mph. The result should be an array of indices.
8. Write a MATLAB program that will:
- a) Create a 1D array of values named x from -2.0 to 2.0 with an increment of 0.05.
 - b) Evaluate the formula $f(x) = -2x^2 + x + 1$ for the values in the variable x.
 - c) Plot f(x) versus x.
 - d) Using a comparison and indexing, determine the locations (x values) where function f is zero. Verify the locations using the plot.
 - e) Using a comparison and indexing, determine the locations (x values) where function f is greater than zero. Verify the locations using the plot.

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