

---

Remember to indent the bodies of your IF-THEN and looping structures.

- 1) (4 pts) Write a MATLAB script that will have the user input a value of  $n$ , then compute  $n!$ . Your script should include error checking. If the value of  $n$  is negative or not an integer, the script should print out an appropriate error message, otherwise the program should print out the value of  $n!$ . Remember that  $0! = 1$ . Test your program using  $n = 5, 7.8, -6$ .
- 2) (5 pts) Suppose that MATLAB did not have the `linspace` function and you need to generate a vector of  $n + 1$  equally spaced points on some interval of the  $x$ -axis,  $[a, b]$ , given the values of  $a, b$  and the number of subdivisions,  $n$ . There are 2 ways to do this:

```
Method 1:
    h = (b-a)/n
    x(1) = a
    for i = 2:n+1
        x(i) = x(i-1) + h
    end
```

```
Method 2:
    h = (b-a)/n
    for i = 1:n+1
        x(i) = a + (i-1)*h
    end
```

Test both methods using the values  $a = -\frac{\pi}{2}, b = \frac{\pi}{3}$  and  $n = 123456789$ . For both cases, compute the relative error in the value of  $x(n+1)$  once the loop terminates (this should be equal to  $b$ ). Recall that relative error is defined as

$$\text{Relative Error} = \frac{\text{Approximate value} - \text{Exact Value}}{\text{Exact Value}}$$

Which method is more accurate (*i.e.*, which method has the smaller relative error)? Explain why the more accurate method has the lower relative error.

- 3) (3 pts) The `rand` function can be used to generate random numbers in the interval  $[0,1)$ . For example,

```
>> x = rand(10,1)
```

will generate a column vector of length 10 with 10 random numbers.

Write a script that will generate a random vector of length 100, then counts the number of elements in the vector that are less than 0.5 and the number that are greater than or equal to 0.5.