1. Create a vector of the natural numbers between 31 and 75 which are multiples of 4.

2. Let x = [1 9 5 8].

   a. Add 5 to the even-index elements

   b. Compute the cubic root of each element

   c. Compute the square of each element

   d. Add each element's index to it (example: 9+2, 8+4) (Hint: use a loop)

3. Given the array A = [1 5 3; 9 6 2; 4 5 3], provide the commands needed to

   a. assign the first and last row of A to a vector called x

   b. assign the last 2 rows of A to an array called y

4. Given the arrays x = [1 4 8], y = [2 1 5] and A = [3 1 6; 5 2 7], determine which of the following statements will correctly execute and provide the result. If the command will not correctly execute, state why it will not.

   a. x + y

   b. x + A

   c. x' + y

   d. A - [x' y']

   e. [x ; y']

   f. [x ; y]

   g. A - 3

5. Evaluate the following MATLAB expressions by hand and use MATLAB to check the answers

   a. 2 / 2 * 3

   b. 6 - 2 / 5 + 7 ^ 2 - 1

c. 10 / 2 \ 5 - 3 + 2 * 4

d. 3 ^ 2 / 4

e. 3 ^ 2 ^ 2

f. 2 + round(6 / 9 + 3 * 2) / 2 - 3

g. 2 + floor(6 / 9 + 3 * 2) / 2 - 3

h. 2 + ceil(6 / 9 + 3 * 2) / 2 - 3

6. Create a vector x with the elements ...

a. 3, 6, 9, 12, ...

b. -3, -6, -9, -12, ...

c. 1/2, -3/4, 5/8, -7/16, ...

d. $x_n = \frac{(-1)^{n+1}}{2n-1}, n = 1\ to\ 15$

7. Using the following series, compute Euler's number up to an error less than 10^{-6}:

$$p_n = 1 - \frac{1}{1!} + \frac{1}{2!} - \frac{1}{3!} + \cdots + (-1)^n \frac{1}{n!}.$$

How many of elements should be added up?

8. Given a vector x of length n, compute:

a. $\ln(2 + x + x^2)$

b. $e^{x(1+\cos(3x))}$

c. $\frac{sinx}{x}$(observe this functions behavior as x approaches zero)

d. $sec^2(x) + cot(x) - 1$

Test that your solution works for x = -2:0.2:2

9. Write down the MATLAB expression(s) that will compute the length of the third side of a triangle given the lengths of the other two sides, given the cosine rule

c2 = a2 + b2 - 2(a)(b) cos(x)

where x is the included angle between the given sides.

10. Plot the functions x, e^x and $\sin^{-1} x$ over the interval -1< x < 1 ...

a. on rectangular paper

b. on semilog paper (logarithm on the y-axis)

c. on log-log paper

Be sure to use an appropriate mesh of x values to get a smooth set of curves.

11. Make a good plot (i.e., a non-choppy plot) of the function

f(x) = sin(1/x)

for 0.01 < x < 0.1.

12. Plot the expression (determined in modeling the growth of the US population)

P(t) = 197,273,000/(1 + e-0.0313(t - 1913.25))

where is the date, in years AD, using t = 1790 to 2000. What population is predicted in the year 2020?

13. Design an arbitrary nonlinear system of 5 equation and 5 unknowns and solve it in MATLAB.

14. Create an appropriate neural network to estimate the following function:

$$f(x,y,z) = x \times e^{\sin(x)+y\times\cos(z)}$$

$$-\pi < x, y, z < \pi$$