1. Suppose \(x = [1:10]\). Execute the following commands and see what \(x\) looks like.

\[
x(1:2:9) = \text{zeros}(1,5)
\]
\[
x(9:-2:1) = [1:5]
\]
\[
x([1:4]) = 11
\]
\[
x([2;3;10;2]) = [x(2) \ x(3) \ x(10) \ x(2)]
\]
\[
x([2;3;10;2]) = [x(2);x(3);x(10);x(2)]
\]

sol:

```matlab
>> x = [1:10]
x =
    1     2     3     4     5     6     7     8     9    10
>> x(1:2:9) = zeros(1,5)
x =
    0     2     0     4     0     6     0     8     0    10
>> x(9:-2:1) = [1:5]
x =
    5     2     4     4     3     6     2     8     1    10
>> x([1:4]) = 11
x =
   11    11    11    11     3     6     2     8     1    10
>> x([2;3;10;2]) = [x(2) \ x(3) \ x(10) \ x(2)]
x =
   11    11    11    11     3     6     2     8     1    10
>> x([2;3;10;2]) = [x(2);x(3);x(10);x(2)]
x =
   11    11    11    11     3     6     2     8     1    10
```
2. Write a MATLAB script that plots the functions $x, x^2, \ldots, x^m$ across the interval $[0, 1]$. All the plots should appear in the same window where $m$ is a positive integer.

```matlab
sol:
>> x=0:0.05:1;
>> for m=1:100
  y(m,:) = x.^m;
end
>> plot(x,y)
```

![Figure 1: Problem 2](image)

3. $\sin x$, $2\sin 2x$, $4\sin 4x$, and $8\sin 8x$ across the interval $[0,2\pi]$. All the plots should appear in succession with appropriate pauses in between the plots.

sol:
4. Use the functions \texttt{meshgrid} and \texttt{mesh} to obtain a three-dimensional plot of the function

\[ z = \frac{2xy}{x^2 + y^2}, \quad x = 1 : 0.1 : 3 \text{ and } y = 1 : 0.1 : 3. \]

Redraw the surface using the functions \texttt{surf}, \texttt{surfl} and \texttt{contour}.

\[ \text{sol:} \]
>> a=1:0.1:3;
>> b=1:0.1:3;
>> [x,y]=meshgrid(a,b);
>> z=(2*x.*y)./(x.^2+y.^2);
>> mesh(x,y,z)
>> surf(x,y,z)
>> surfl(x,y,z)
>> contour(x,y,z)

Figure 3: This is the result of using mesh function.

5. Assume that \( x \) is an initialized MATLAB array and that \( m \) is a positive integer. Using the \texttt{ones} function, the pointwise array multiplication operator \( .* \), and MATLAB’s ability to scale and add arrays, write a fragment that computes an array \( y \) with the property that the \( i \)th component of \( y \) has the following value:

\[
y_i = \sum_{k=0}^{n} \frac{x_i^k}{k!}.
\]
Figure 4: This is the result of using surf function.

sol:

```matlab
clear m = input('please enter m:');
n = input('please enter n:');
X(:,1) = random('Normal',0,1,m,1);
Y(:,1) = ones(m,1);
for i = 0:n
    for j=1:m
        Y(j,1) = Y(j,1) + X(j,1)/fact(i);
    end
end
```

6. Suppose \( x = \text{linspace}(0,1,10) \). Construct another vector \( \hat{x} = x + 1e^{-4} \). The error in \( \hat{x} \) is given by \( \epsilon = x - \hat{x} \). Compute \( \epsilon \) and its infinity norm and 2-norm. (Hint: Use \texttt{help norm} in MATLAB to find out how to compute the norms.)
Figure 5: This is the result of using surfl function.

sol:

```matlab
>> x = linspace(0,1,10);
>> xhat=x+1e-4;
>> epsilon=x-xhat
>> norm(epsilon,inf)
ans =
    1.0000e-004

>> norm(epsilon,2)
ans =
    3.1623e-004
```
Figure 6: This is the result of using contour function.