ENGR 133, Problem Set 02

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Exercise 2.13

```
clear
close all
clc

% Problem presentation
%{
Given the matrices A = [9 6 ; 2 7] and B = [8, 9 ; 6, 2] do the
following by hand, then check your answer using MATLAB.
a. Find the sum of A and B.
b. Find the array product w = A. * B.
c. Find the array product z = B.*A.
Is z = w?
%}

% Pseudocode
% Initialize variables
% Perform calculations
% Display results

% Initialize variables
A = [9, 6 ; 2, 7];
B = [8, 9 ; 6, 2];

% Perform calculations
% Evaluate a
a = A + B;

% Evaluate b
b = A.*B;

% Evaluate c
c = B.*A;

% Display the results
fprintf('For part a the result is: \n')
disp(a)
```

```
fprintf('For part b the result is: \n')
disp(b)
fprintf('For part c the result is: \n')
disp(c)
fprintf('According to the results z and w both equal to: \n')
disp(c)
```

```
For part a the result is:
    17    15
     8     9

For part b the result is:
    72    54
    12    14

For part c the result is:
    72    54
    12    14

According to the results z and w both equal to:
    72    54
    12    14
```

Exercise 2.16

```
clear
close all
clc

% Problem presentation
%{
Given the matrices A = [5, 9 ; 6, 2] and B = [4,7 ; 2, 8] do the
 following by
hand, then check your answers using MATLAB. a. Find the array quotient
 C = A./B
b. Find the array quotient D = B./A. c. Find the quotient E = A.\B. d.
 Find the
array quotient F = B.\A. e. Are any of the C,B,E or F equal?
%}

% Pseudocode
% Initialize variables
% Perform calculations
% Display results

% Initialize variables
A = [5, 9; 6, 2];
B = [4, 7; 2, 8];

% Perform calculations
% Evaluate a
a = A./B;
```

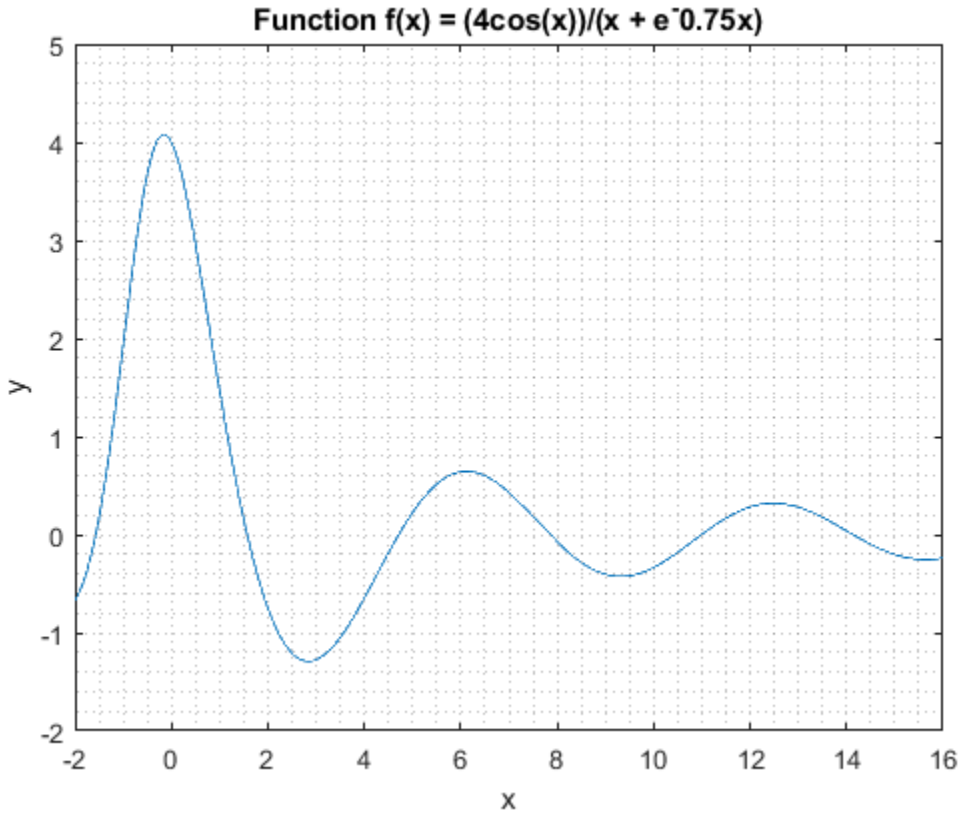
```
% Evaluate b
b = B./A;

% Evalutae c
c = A.\B;

% Evaluate d
d = B.\A;

% Display results
fprintf('For a the result is: \n')
disp(a)
fprintf('For b the result is: \n')
disp(b)
fprintf('For c the result is: \n')
disp(c)
fprintf('For d the result is: \n')
disp(d)
fprintf('From the results, a and d are the same while c and b are
 similar')
```

```
For a the result is:
    1.2500    1.2857
    3.0000    0.2500

For b the result is:
    0.8000    0.7778
    0.3333    4.0000

For c the result is:
    0.8000    0.7778
    0.3333    4.0000

For d the result is:
    1.2500    1.2857
    3.0000    0.2500

From the results, a and d are the same while c and b are similar
```

Exercise 2.19

```
clear
close all
clc

% Problem presentation
%{
Plot the following function for x over the interval -2 <= x <= 16
f(x) = (4cosx)/(x+e^-0.75x) Use enough points to get a smooth curve.
%}

% Pseudocode
```

```
% Initialize variables
% Display results

% Initialize variables
x = (-2:0.01:16);
y = (4*cos(x))./(x + exp(-0.75*x));

% Display results
plot(x,y), xlabel('x'), ylabel('y'),
title('Function f(x) = (4cos(x))/(x + e^-0.75x)')
grid minor
```



Exercise 2.26

```
clear
close all
clc

% Problem presentation
%{
Two divers start at the surface and establish the following coordinate
system: x is to the west, y is to the north, and z is down. Diver 1
 swims
60 ft east, then 25 ft south, and then dives 30 ft. At the same time,
 diver
2 dives 20 ft, swims east 30 ft, and then south 55 ft.
```

```
a. compute the distance between diver 1 and the starting point.
b. How far in each direction must diver 1 swim to reach diver 2?
c. How far in a straight line must diver 1 swim to reach diver 2?
%}

% Pseudocode
% Initialize variables
% Perform calculations
% Display results

% Initialize variables
divr1 = [-60, -25, 30];
divr2 = [-30, -55, 20];

% Perform calculations
% Compute the distance between diver 1 and the starting point
d = sqrt((divr1(1)-divr2(1))^2 + (divr1(2)-divr2(2))^2 + (divr1(3)-
divr2(3))^2);

% Calculate the distance in each direction diver 1 needs to reach
 diver 2
x = divr2(1) - divr1(1); % represent east direction
y = divr2(2) - divr1(2); % represent south direction
z = divr2(3) - divr1(3); % represent north direction

% Calculate the distance in a straight line to catch up to diver 2
  % this is the same value as part a
  % sum(x,y,z)

% Display the results
fprintf('For part a diver 1 travels in d distance of (ft): %4.2f
 \n',d)
fprintf('Diver 1 travels this distance in east direction: %4.2f \n',x)
fprintf('Diver 1 travels this distance in south direction: %4.2f
 \n',y)
fprintf('Diver 1 travels this distance in north direction: %4.2f
 \n',z)
fprintf('The distance in a straight line diver 1 must swim is: %4.2f
 \n',d)
```

```
For part a diver 1 travels in d distance of (ft): 43.59
Diver 1 travels this distance in east direction: 30.00
Diver 1 travels this distance in south direction: -30.00
Diver 1 travels this distance in north direction: -10.00
The distance in a straight line diver 1 must swim is: 43.59
```

Exercise 2.30

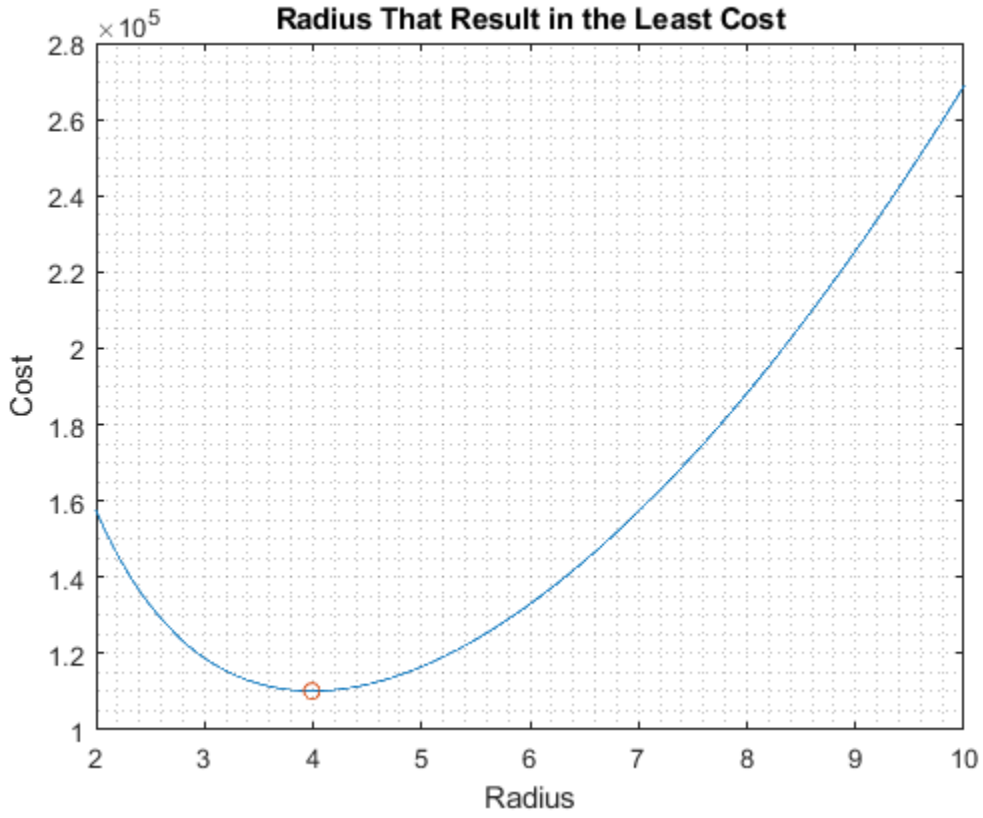
```
clear
close all
clc

% Problem Statement
```

```
%{
A water tank consists of a cylindrical part of radius r and height h,
 and a
hemispherical top. The tank is to be constructed to hold 500m^3 of
 fluid when
filled. The surface area of the cylindrical part is 2 pi r h, and its
 volume is
pi r^2 h. The surface area of the hemispherical top is given by 2 pi
 r^2, and
its volume is given by 2 pi r^3/3. The cost to construct the
 cylindrical part
of the tank is $300/m^2 of surface area; the hemispherical part costs
 $400/m^2.
Plot the cost versus r for 2 <= r <= 10 m, and determine the radius
 that results
in the least cost. Compute the corresponding height h.
%}

% Pseudocode
% Initialize variables
% Perform Calculations
% Display the results

% Initialize variables
V = 500; % V represents volume
R = (2:0.01:10); % R represents range
% V = pi*R^2*h + 2/3*pi*R^2 this represents the equation for volume

% Determine the height h
h = (V- 2./3.*pi.*R.^2)./(pi.*R.^2);

% Calculate the cost of the hemispherical part
Cost_s = 400*(2.*pi.*R.^2);

% Calculate the cost of the cylinder
Cost_c = 300*(2.*pi.*R.*h);

% Calculate the total cost
Cost_tot = Cost_s + Cost_c;

% Determine the minimum value for cost and index
[minCost_tot, index] = min(Cost_tot);
R(index);
Cost_tot(index);

% Plot the data
plot(R, Cost_tot, R(index), minCost_tot,'o'), xlabel('Radius'),
 ylabel('Cost')
title('Radius That Result in the Least Cost')
grid minor
% Display the results
fprintf('For problem 2.30 the minimum cost is: ')
disp(Cost_tot(index))
fprintf('radius with the least cost is: ')
```

```
disp(R(index))
```

```
For problem 2.30 the minimum cost is:    1.1019e+05
```

```
radius with the least cost is:     3.9900
```



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