Chapter 5 HW

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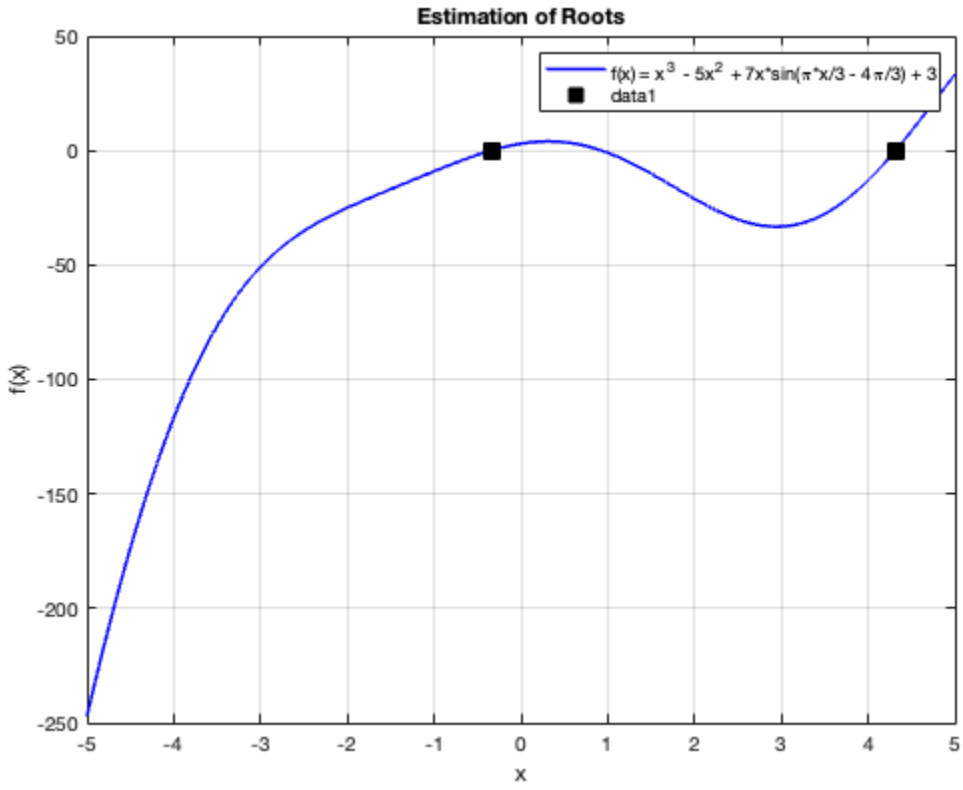
Problem 5

Define the function

```
f = @(x) x.^3 - 5*x.^2 + 7*x.*sin(pi*x/3 - 4*pi/3) + 3

% Define the range of x values
x_values = linspace(-5, 5, 1000);

% Plot the function
figure;
plot(x_values, f(x_values), 'b-', 'LineWidth', 1.5);
hold on;
grid on;

% Labeling the graph
title('Estimation of Roots');
xlabel('x');
ylabel('f(x)');
legend('f(x) = x^3 - 5x^2 + 7x*sin(\pi*x/3 - 4\pi/3) + 3');

% Part B: Using fzero to find roots accurately

% Initial guesses for roots (based on the plot)
initial_guesses = [-4, -1.5, 3.5];

% Finding roots using fzero
roots_found = zeros(size(initial_guesses));
for i = 1:length(initial_guesses)
    roots_found(i) = fzero(f, initial_guesses(i));
end
```

```
% Plotting roots as black squares
plot(roots_found, f(roots_found), 'ks', 'MarkerSize', 10, 'MarkerFaceColor',
'k');

% Display roots
disp('Roots found:');
disp(roots_found);
```

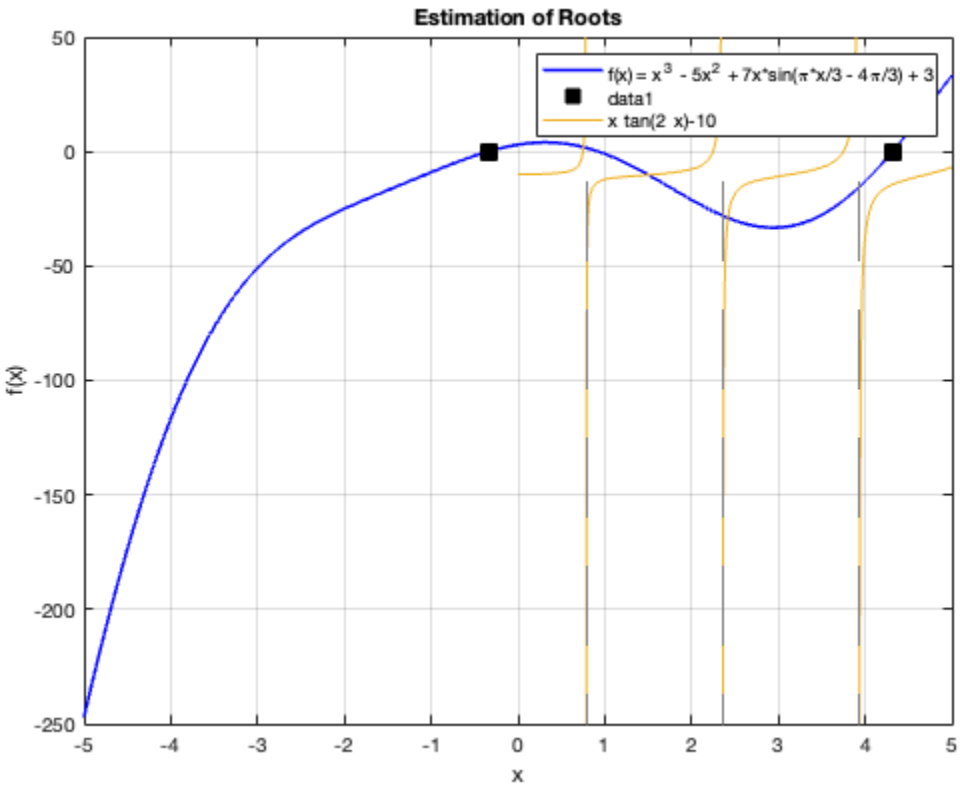
```
f =

  function_handle with value:

    @(x)x.^3-5*x.^2+7*x.*sin(pi*x/3-4*pi/3)+3

Roots found:
    4.3143   -0.3433    4.3143
```



Problem 6

```
clc; clear;

% Define the function handle
f = @(x) x.*tan(2.*x) - 10;
```

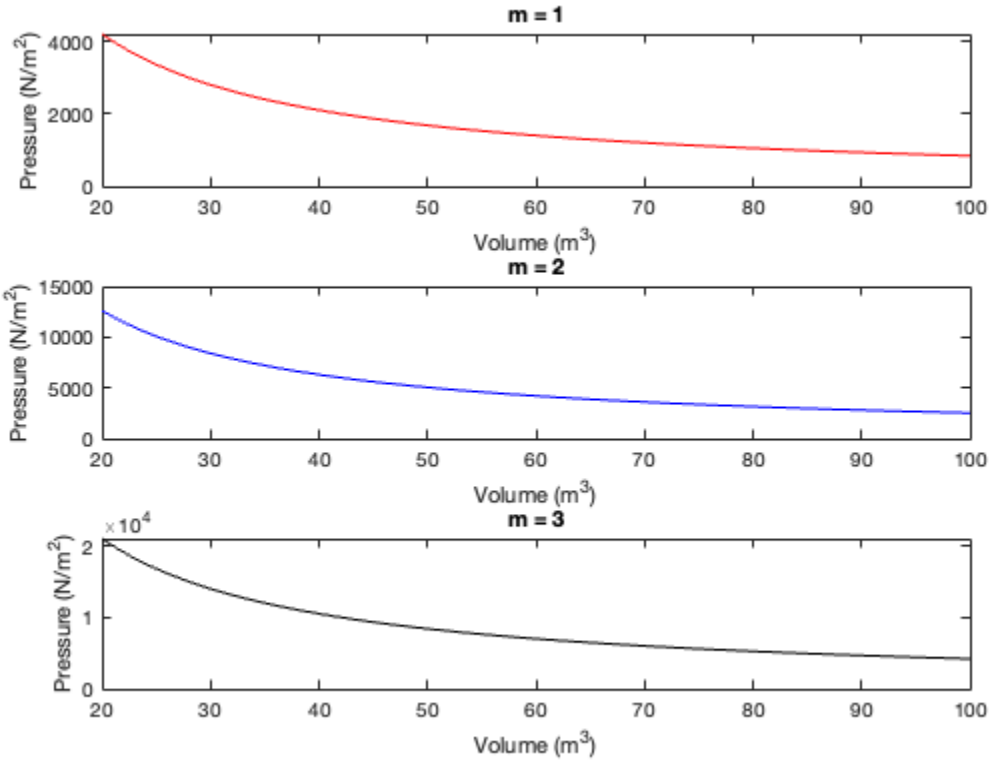
```
% Plot the function over the range [0, 5]
fplot(f, [0, 5])
```



Problem 20

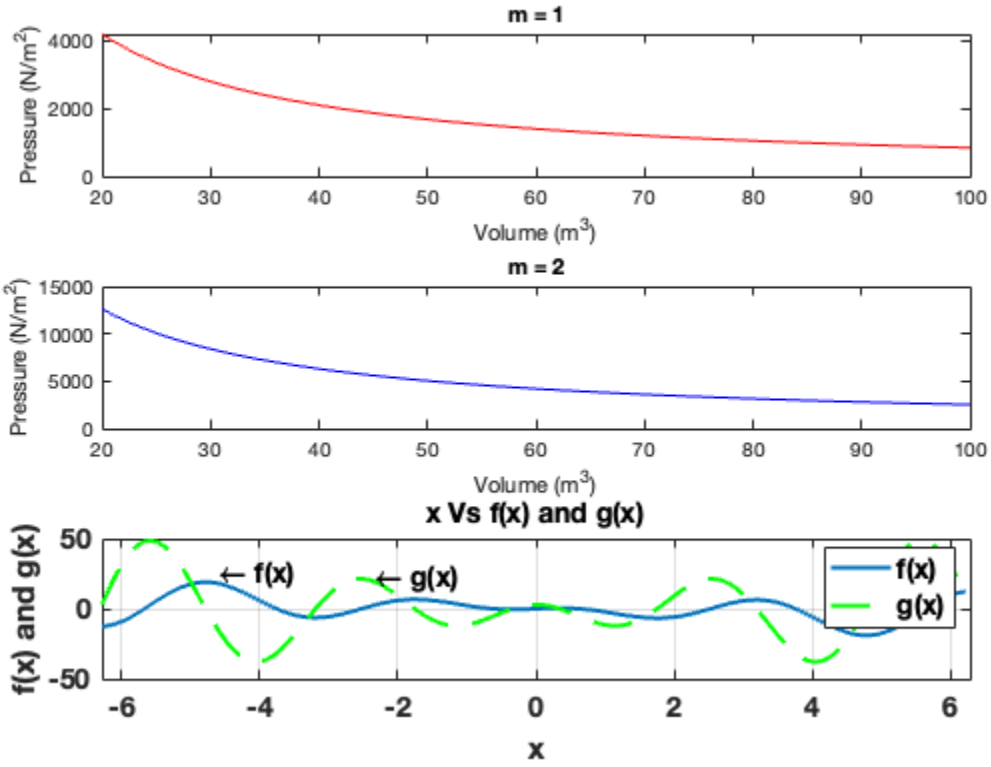
```
R = 286.7;
T = 293;
V = 20:100;
m = [1 3 5];
P = [];
for i = 1:3
    P = [P; (m(i)*R*T)./V];
end

subplot(3, 1, 1)
plot(V, P(1, :), 'r-');
xlabel('Volume (m^3)');
ylabel('Pressure (N/m^2)');
title('m = 1');

subplot(3, 1, 2)
plot(V, P(2, :), 'b-');
xlabel('Volume (m^3)');
ylabel('Pressure (N/m^2)');
title('m = 2');
```

```
subplot(3, 1, 3)
plot(V, P(3, :), '-k');
xlabel('Volume (m^3)');
ylabel('Pressure (N/m^2)');
title('m = 3');
```



Problem 30

```
clc; clear;
x = -2*pi:0.1:2*pi ;
fx = 6*x.*cos(x).^2 - 4*x;
gx = -18*x.*cos(x).*sin(x) + 9*cos(x).^2 - 6;
plot(x,fx,'linewidth',2);
gtext(' \leftarrow f(x)','fontsize',14,'fontweight','bold');
hold on;
grid on;
plot(x,gx,'--g','linewidth',2);
xlim([-2*pi 2*pi]);
xlabel('x','fontsize',14,'fontweight','bold');
ylabel('f(x) and g(x)','fontsize',14,'fontweight','bold');
set(gca,'fontsize',14,'fontweight','bold');
title('x Vs f(x) and g(x)','fontsize',14,'fontweight','bold');
legend('f(x)','g(x)','fontsize',14,'fontweight','bold');
gtext(' \leftarrow g(x)','fontsize',14,'fontweight','bold');
```

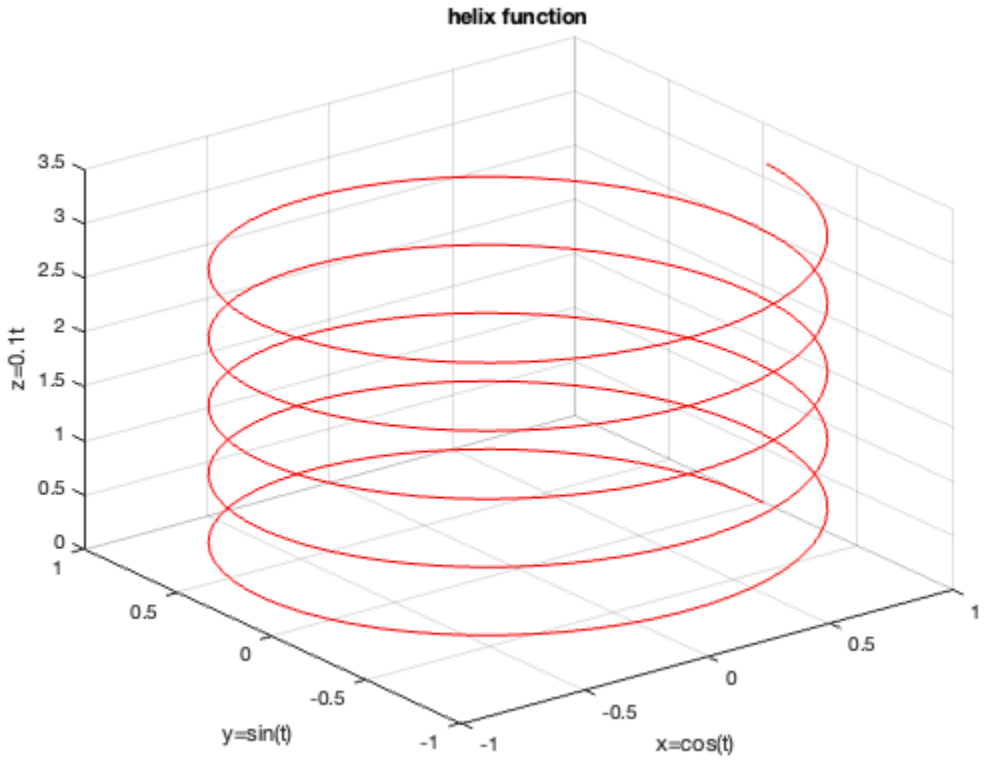


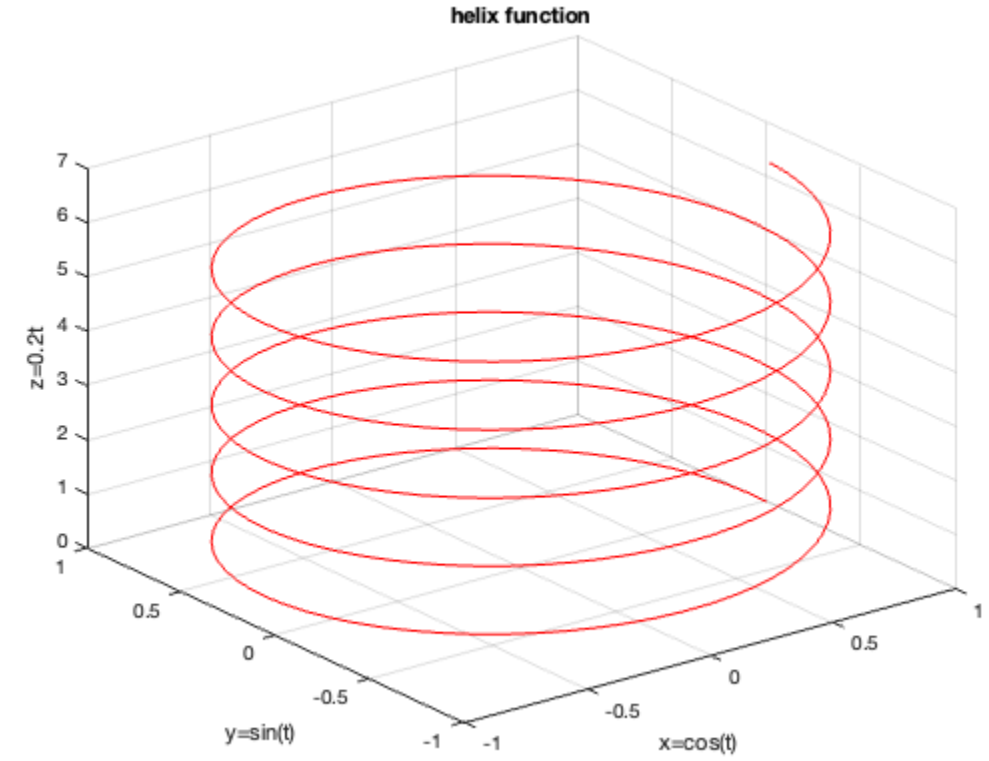
Problem 37

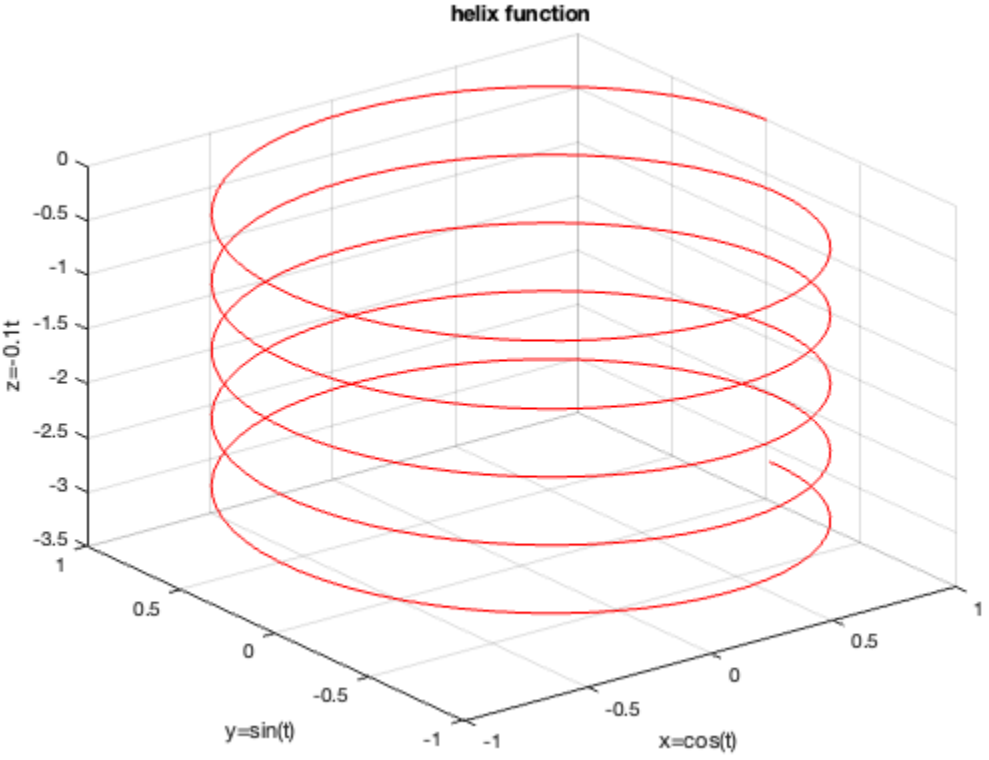
a.

```
t=0:0.1:10*pi;
a=1;
b=0.1;
x=a*cos(t);
y=a*sin(t);
z=b*t;
figure
plot3(x,y,z,'r')
xlabel('x=cos(t)');
ylabel('y=sin(t)');
zlabel('z=0.1t');
title('helix function');
grid on
% b.
t=0:0.1:10*pi;
a=1;
b=0.2;
x=a*cos(t);
y=a*sin(t);
z=b*t;
figure
plot3(x,y,z,'r')
```

```
xlabel('x=cos(t)');
ylabel('y=sin(t)');
zlabel('z=0.2t');
title('helix function');
grid on
% c.
t=0:0.1:10*pi;
a=1;
b=-0.1;
x=a*cos(t);
y=a*sin(t);
z=b*t;
figure
plot3(x,y,z,'r')
xlabel('x=cos(t)');
ylabel('y=sin(t)');
zlabel('z=-0.1t');
title('helix function');
grid on
```

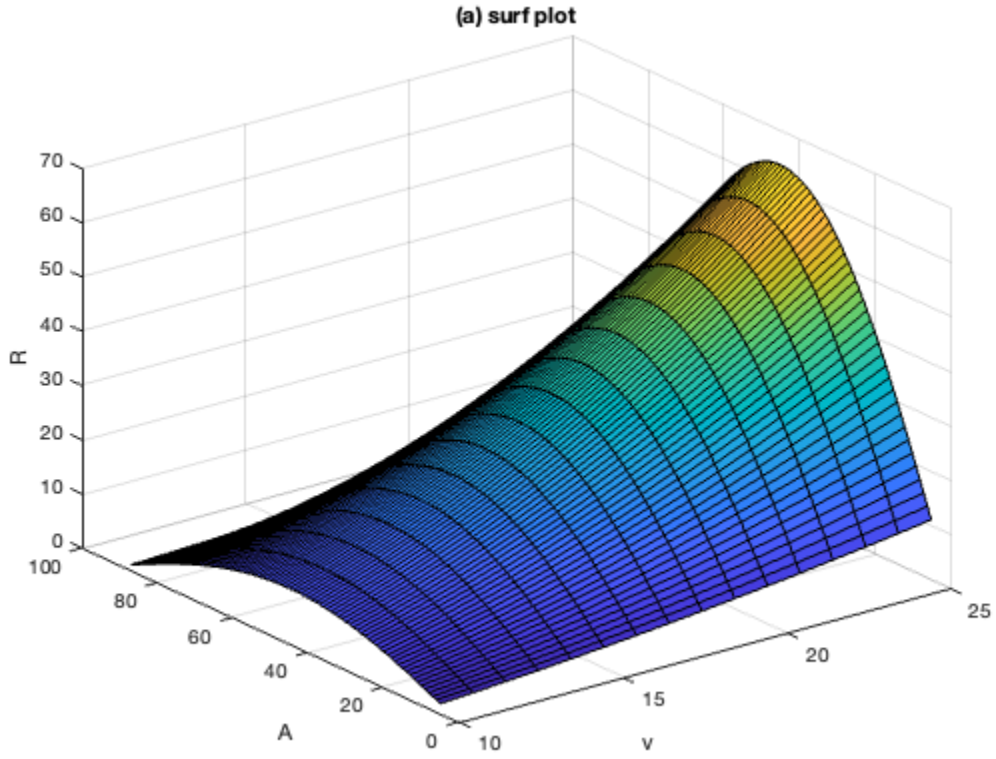


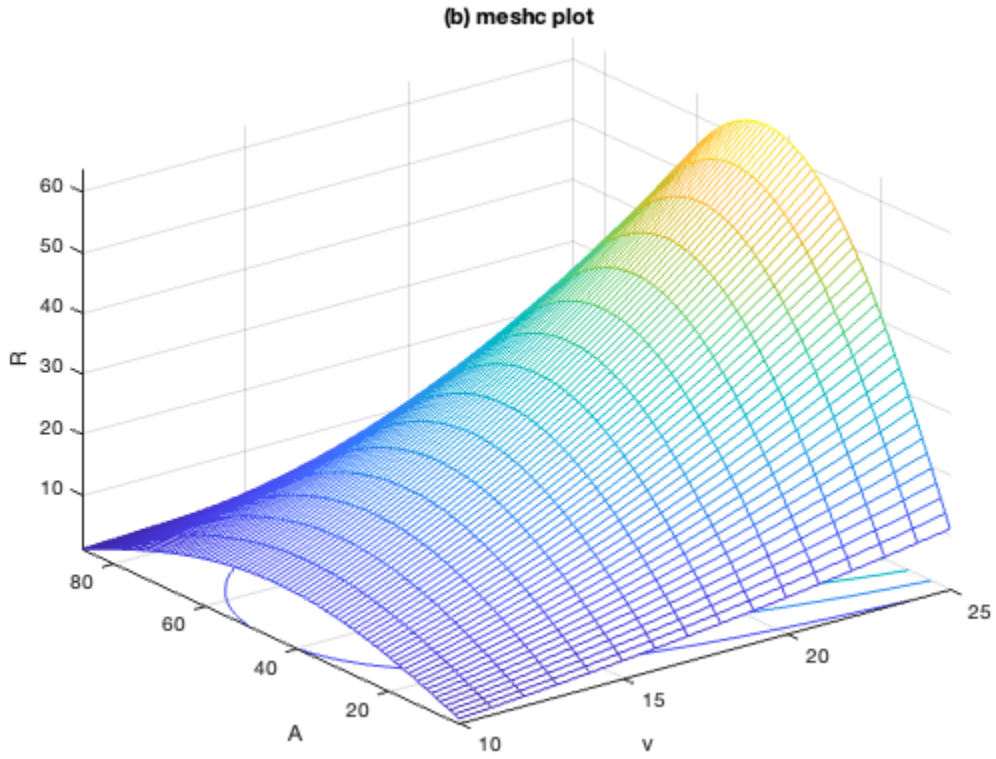

helix function
z=0.2t
y=sin(t)
x=cos(t)


helix function
z=-0.1t
y=sin(t)
x=cos(t)

Problem 49

```
clc
clear all
close all
%defining intial velocity with spacing of 1
V = 10:1:25 ;
%defining Angle A with spacing of 1
a = 5:1:87 ;
% meshing
[v ,A ] = meshgrid(V,a);
%defining acceleration due to gravity
g = 9.81 ;
% calculating Range of projectile R , cosd means in angle in degree
R = 2/g.*v.^2.*cosd(A).*sind(A);
%plotting 3d surface plot
surf(v,A,R)
xlabel('v')
ylabel('A')
zlabel('R')
title('(a) surf plot')
figure
%plotting contour plot under mesh surface
meshc(v,A,R)
xlabel('v')
ylabel('A')
zlabel('R')
title(' (b) meshc plot')
```

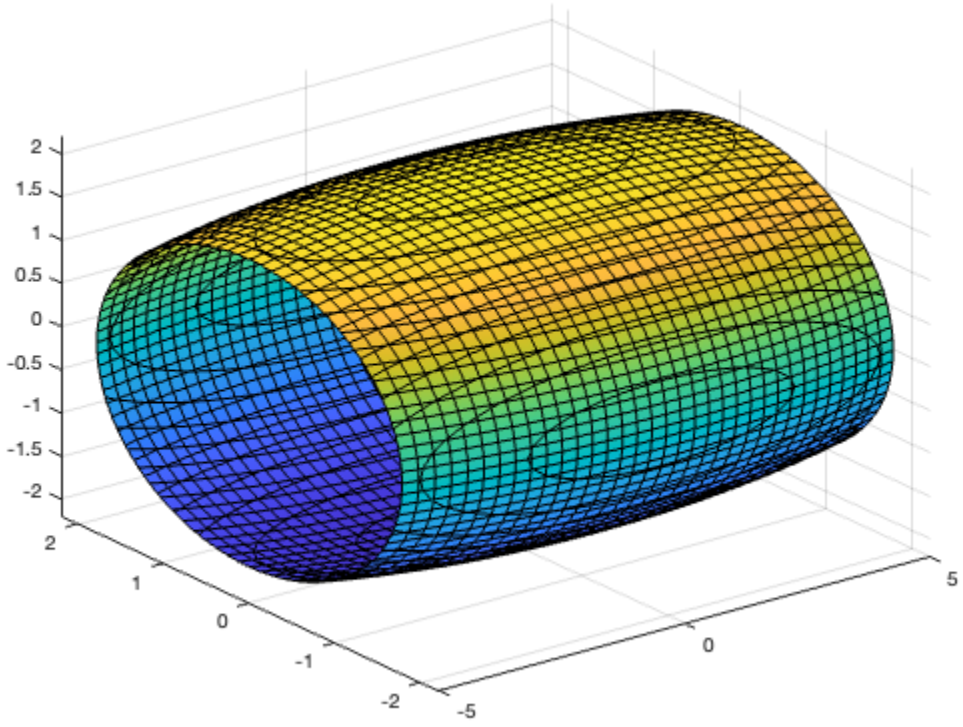

(a) surf plot
R
70
60
50
40
30
20
10
0
100
80
60
40
20
0
A
10
15
20
25
v


(b) meshc plot
R
60
50
40
30
20
10
80
60
40
20
A
10
15
20
25
v

Problem 50

defining function handle

```
f = @(x,y,z) x.^2 + 30 * y.^2 + 30 * z.^2 - 120;
% passing function in in build function
fimplicit3(f)
```



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