LAB Home Assignment 2 Due Date 15.02.2023

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Question 1.

Create sine series script file. In main file Calling the script file

```
x = [0 pi/6 pi/4 pi/2]; % Angle in radians
n = [1 5 10 20]; % Number of terms
for x1 = 1:length(x)
    for n1 = 1:length(n)
        Value_sine = sineseries(x(x1),n(x1));
        fprintf('Value of sineseries at x = %g and n = %g = %.10g
 \n',x(x1),n(n1),Value_sine)
        %          error = sin(x(x1)) - Value_sine;
    end
end
```

```
Value of sineseries at x = 0 and n = 1 = 0
Value of sineseries at x = 0 and n = 5 = 0
Value of sineseries at x = 0 and n = 10 = 0
Value of sineseries at x = 0 and n = 20 = 0
Value of sineseries at x = 0.523599 and n = 1 = 0.5
Value of sineseries at x = 0.523599 and n = 5 = 0.5
Value of sineseries at x = 0.523599 and n = 10 = 0.5
Value of sineseries at x = 0.523599 and n = 20 = 0.5
Value of sineseries at x = 0.785398 and n = 1 = 0.7071067812
Value of sineseries at x = 0.785398 and n = 5 = 0.7071067812
Value of sineseries at x = 0.785398 and n = 10 = 0.7071067812
Value of sineseries at x = 0.785398 and n = 20 = 0.7071067812
Value of sineseries at x = 1.5708 and n = 1 = 1
Value of sineseries at x = 1.5708 and n = 5 = 1
Value of sineseries at x = 1.5708 and n = 10 = 1
Value of sineseries at x = 1.5708 and n = 20 = 1
```

Question 2

Projectile Motion Find maximum height, total time, range

```
velocity = 20;
theta = 0:5:50;
[MaximumHeight, Total_Time, Range] = projectileMotion(velocity,theta);
for htm = 1:length(MaximumHeight)
    fprintf('For velocity of 20 m/s and angle of %g (degrees), Maximum
 height attained is %g , Total Time is %g and Range is %g \n' ,
 theta(htm),MaximumHeight(htm),Total_Time(htm),Range(htm))
end
```

```
For velocity of 20 m/s and angle of 0 (degrees), Maximum height attained is
 0 , Total Time is 0 and Range is 0
For velocity of 20 m/s and angle of 5 (degrees), Maximum height attained is
 0.154865 , Total Time is 0.355375 and Range is 7.08046
For velocity of 20 m/s and angle of 10 (degrees), Maximum height attained is
 0.614754 , Total Time is 0.708046 and Range is 13.9458
For velocity of 20 m/s and angle of 15 (degrees), Maximum height attained is
 1.36569 , Total Time is 1.05533 and Range is 20.3874
For velocity of 20 m/s and angle of 20 (degrees), Maximum height attained is
 2.38487 , Total Time is 1.39458 and Range is 26.2095
For velocity of 20 m/s and angle of 25 (degrees), Maximum height attained is
 3.64131 , Total Time is 1.72321 and Range is 31.2352
For velocity of 20 m/s and angle of 30 (degrees), Maximum height attained is
 5.09684 , Total Time is 2.03874 and Range is 35.3119
For velocity of 20 m/s and angle of 35 (degrees), Maximum height attained is
 6.70724 , Total Time is 2.33874 and Range is 38.3157
For velocity of 20 m/s and angle of 40 (degrees), Maximum height attained is
 8.42357 , Total Time is 2.62095 and Range is 40.1553
For velocity of 20 m/s and angle of 45 (degrees), Maximum height attained is
 10.1937 , Total Time is 2.88321 and Range is 40.7747
For velocity of 20 m/s and angle of 50 (degrees), Maximum height attained is
 11.9638 , Total Time is 3.12352 and Range is 40.1553
```

Question 3

Write script file for calculating volume of hollow sphere

```
radius_out = 10; % Radius of outer sphere
radius_in = 9; % Radius of inner sphere
volume_HS = Volume_Hollow_sphere(radius_out, radius_in);
fprintf("Volume of Hollow sphere of outer radius (%g) and inner radius (%g) =
 %g \n",radius_out,radius_in,volume_HS)
```

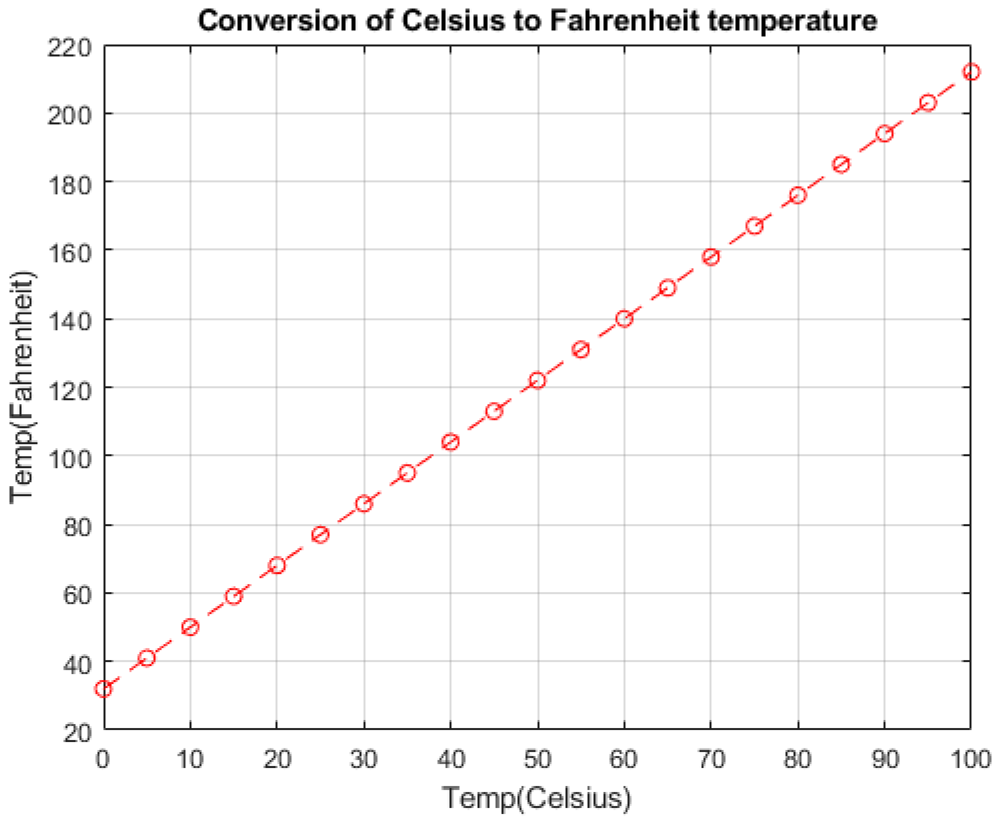
```
Volume of Hollow sphere of outer radius (10) and inner radius (9) = 1135.16
```

Question 4

Write function to convert temp. from C to F

```
Cel = 0:5:100;
Far = TempC2F(Cel);
figure;
plot(Cel,Far,"R--o")
```

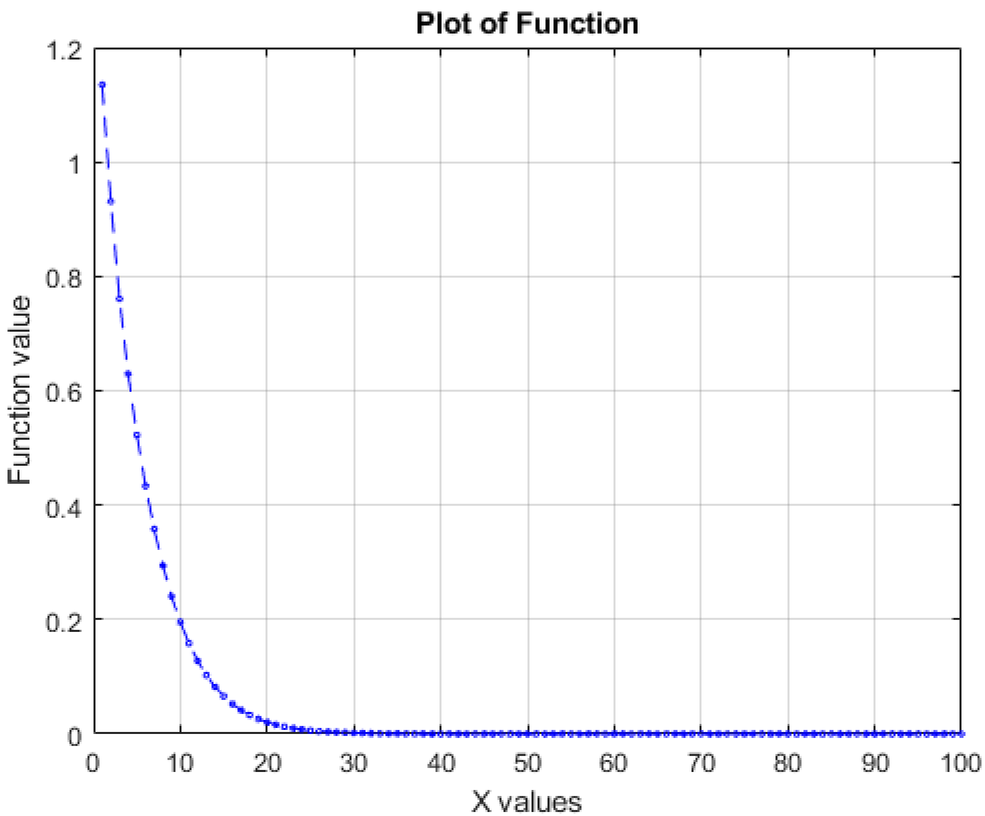
```
grid on
title('Conversion of Celsius to Fahrenheit temperature')
xlabel('Temp(Celsius)')
ylabel('Temp(Fahrenheit)')
```



Question 5

Plot function e^(sqrt(x)) /(x.^2 - x.*e^(x)).^(1/3)

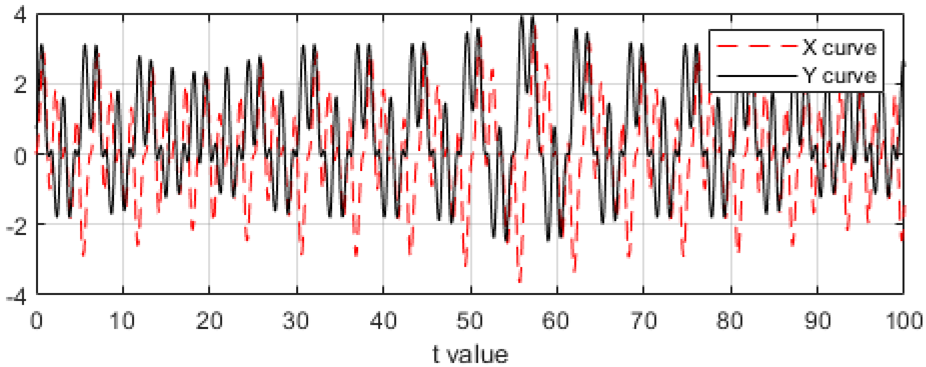
```
warning off
x5 = 0:1:100;
y51 = exp(sqrt(x5));
y52 = (x5.^2 - x5.*exp(x5)).^(1/3);
y5 = y51./y52;
figure;
plot(x5,y5,'b--o','MarkerSize', 2)
grid on
title('Plot of Function')
xlabel('X values')
ylabel('Function value')
```

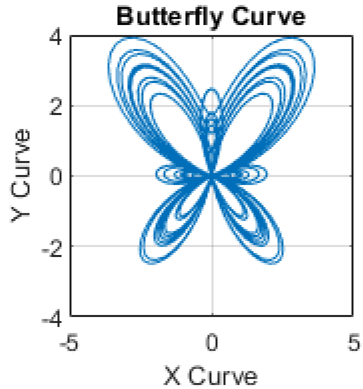


Question 6

Butterfly curve

```
t = 0:1/16:100;
x6 = sin(t).*( exp(cos(t)) - 2*cos(4*t) - sin(t/12).^5);
y6 = cos(t).*(exp(cos(t)) - 2*cos(4*t) - sin(t/12).^5);
figure;
subplot(2,1,1)
plot(t,x6,'R--',t,y6,'K-')
grid on
xlabel('t value')
legend('X curve','Y curve')
subplot(2,1,2)
plot(x6,y6)
xlabel('X Curve')
ylabel('Y Curve')
grid on
axis square
title('Butterfly Curve')
```



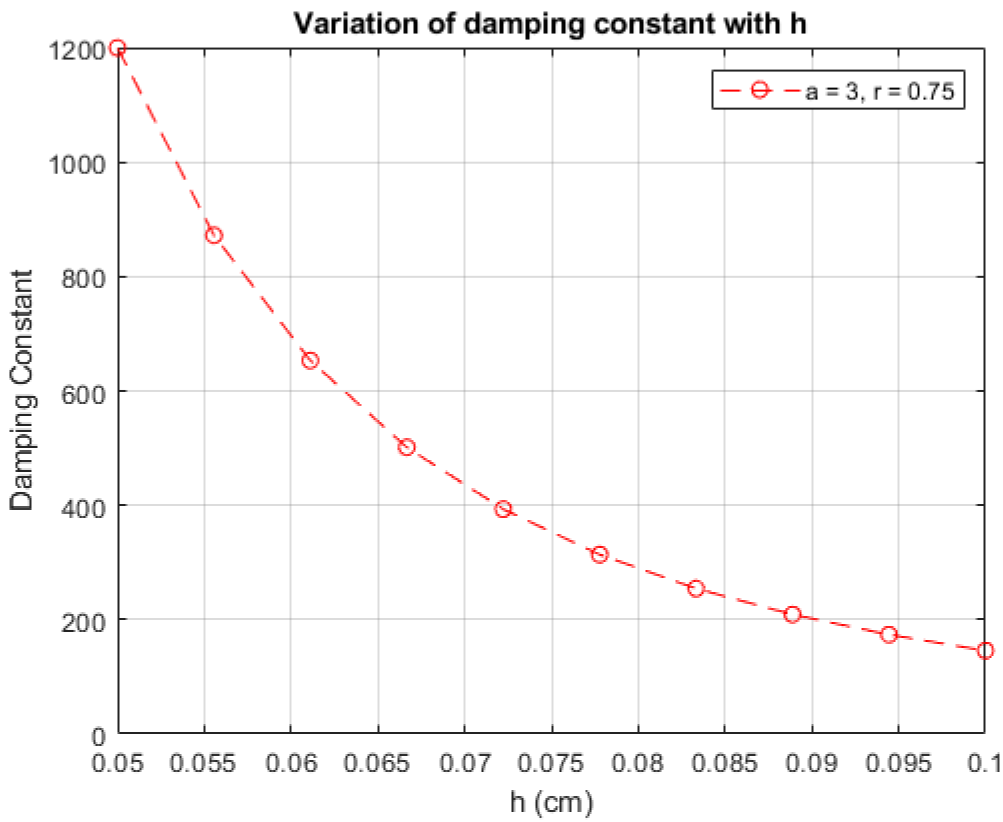


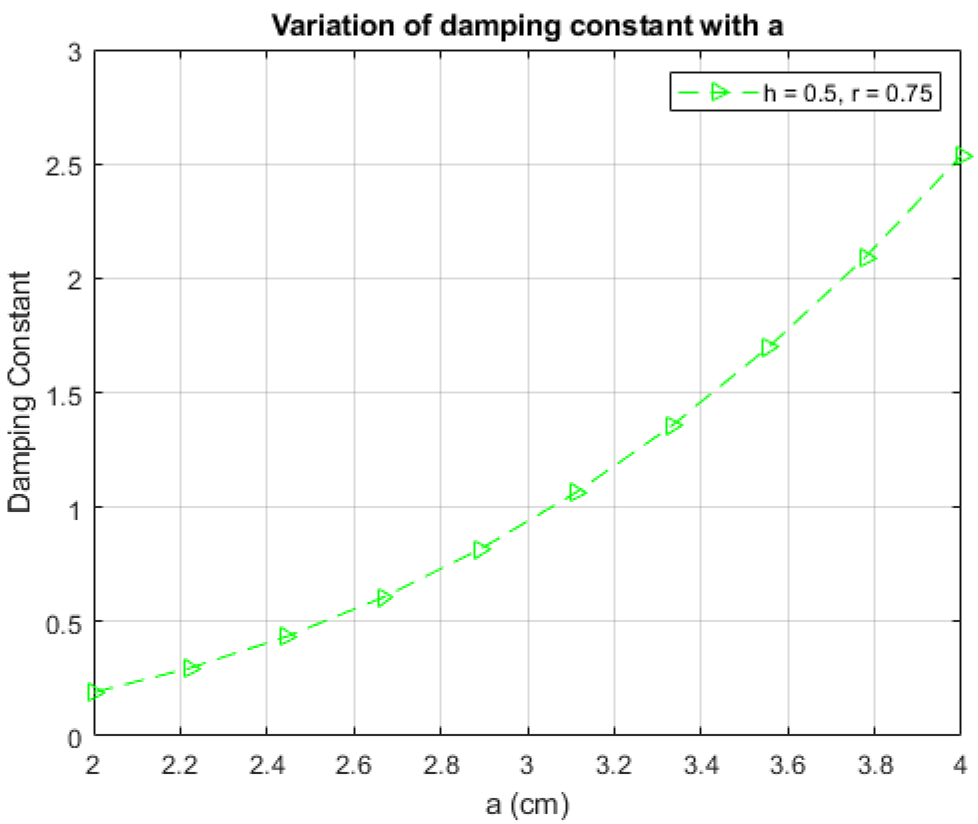
Question 7

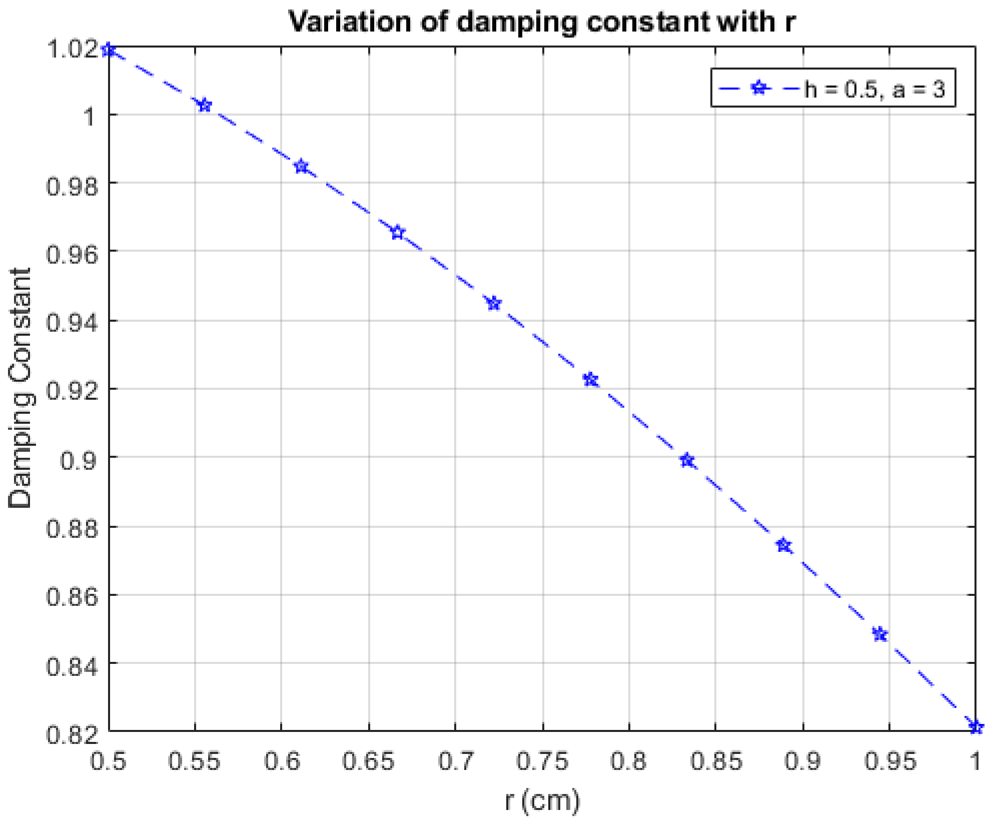
Damping Constant Variation with h,a,e

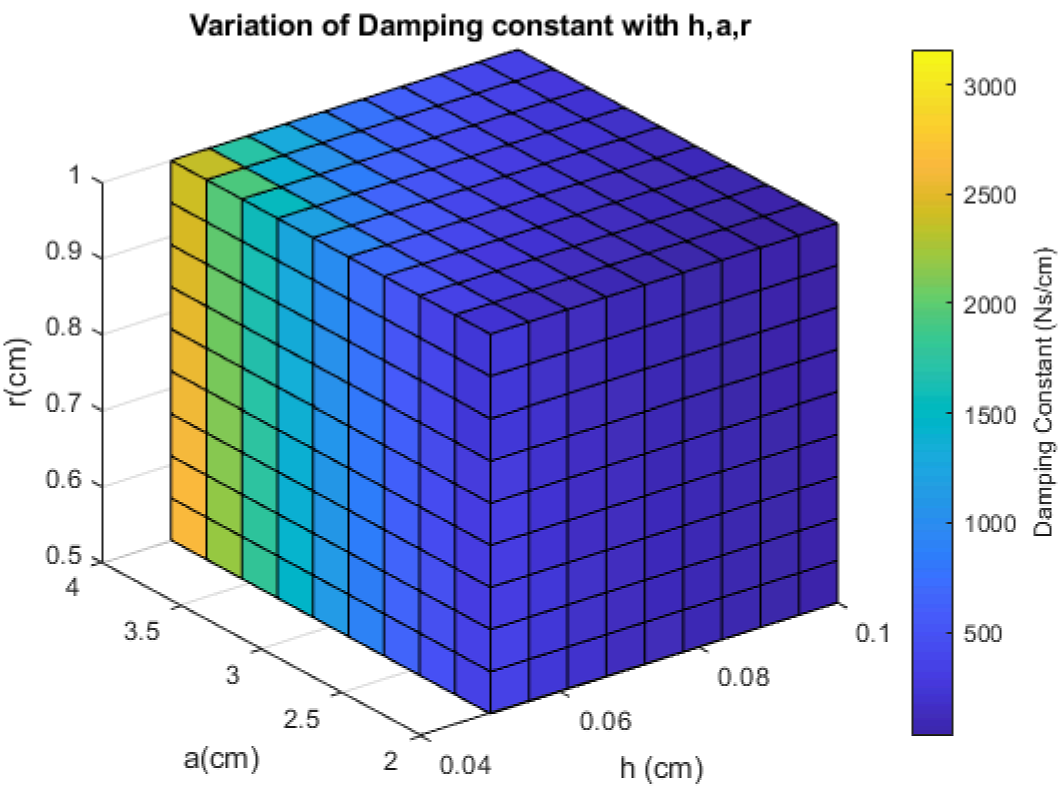
```
num = 10;
mew = 0.3445/10000; % Ns/cm^2
l = 10; % cm
h = linspace(0.05,0.1, num); % cm
a = linspace(2,4, num); % cm
r = linspace(0.5,1, num); % cm
h1 = 0.5;
a1 = 3;
r1 = 0.75;
DCH = (6*pi*mew*l./h.^3).*( (a1-h/2).^2 -r1.^2 ).*( ((a1.^2 - r1.^2)./(a1-
h/2)) - h);
DCA = (6*pi*mew*l./h1.^3)*( (a-h1/2).^2 -r1.^2 ).*( ((a.^2 - r1.^2)./(a-h1/2))
 - h1);
DCR = (6*pi*mew*l./h1.^3).*( (a1-h1/2).^2 -r.^2 ).*( ((a1.^2 - r.^2)./(a1-
h1/2)) - h1);
figure;

plot(h,DCH,"r--o")
ylabel('Damping Constant')
xlabel('h (cm)')
legend('a = 3, r = 0.75')
grid on
```

```
title("Variation of damping constant with h")

figure;
plot(a,DCA,"g-->")
grid on
ylabel('Damping Constant')
xlabel('a (cm)')
title("Variation of damping constant with a")
legend('h = 0.5, r = 0.75')

figure;
plot(r,DCR,"b--p")
grid on
ylabel('Damping Constant')
xlabel('r (cm)')
title("Variation of damping constant with r")
legend('h = 0.5, a = 3')

% Generalised Solution of Question 7

[h2,a2,r2] = meshgrid(h,a,r);
DC = (6*pi*mew*l./h2.^3).*( (a2-h2/2).^2 -r2.^2 ).*( ((a2.^2 - r2.^2)./(a2-
h2/2)) - h2);
figure;
slice(h2,a2,r2,DC,h,a,r)
title('Variation of Damping constant with h,a,r')
xlabel('h (cm)')
ylabel('a(cm)')
zlabel('r(cm)')
DCV=colorbar;
ylabel(DCV,'Damping Constant (Ns/cm)');
view(3)
```


Variation of damping constant with h
a = 3, r = 0.75
Damping Constant
h (cm)
1200
1000
800
600
400
200
0
0.05
0.055
0.06
0.065
0.07
0.075
0.08
0.085
0.09
0.095
0.1


Variation of damping constant with a
h = 0.5, r = 0.75
Damping Constant
a (cm)
3
2.5
2
1.5
1
0.5
0
2
2.2
2.4
2.6
2.8
3
3.2
3.4
3.6
3.8
4


Variation of damping constant with r
h = 0.5, a = 3
Damping Constant
r (cm)
1.02
1
0.98
0.96
0.94
0.92
0.9
0.88
0.86
0.84
0.82
0.5
0.55
0.6
0.65
0.7
0.75
0.8
0.85
0.9
0.95
1


Variation of Damping constant with h,a,r
r(cm)
a(cm)
h (cm)
Damping Constant (Ns/cm)
1
0.9
0.8
0.7
0.6
0.5
4
3.5
3
2.5
2
0.04
0.06
0.08
0.1
3000
2500
2000
1500
1000
500

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