Lab 1 - Dean Styx - MAT 275

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Exercise 1

```
% NOTE: Please suppress output--i.e., use a semicolon ';' at the end
 of any
% commands for which the output is not necessary to answer the
 question.
% Delete these notes before turning in.

% Define input variable theta as discretized row vector (i.e., array).
theta =  [0, pi/6, pi/4, (pi)/2, (3*pi)/4, pi,  (5*pi)/3];

% Define radius.
r = 4;

% Define x and y in terms of theta and r.
x = r*cos(theta);
y = r*sin(theta);

% Check that x and y satisfy the equation of a circle.

if r == sqrt(x.^2+y.^2)
    disp('true')
else
    disp('false')
end
```

```
true
```

Explain results here. Do x and y satisfy the equation of a circle? Why or why not? How does the vector output at the end confirm your answer? Notice I did not include text in the same line where the double-comment is. What this accomplishes is it does not add a title or create a new section in the table of contents when you publish. Using single % starting in the line after the %% turns the comments black as opposed to green. Yes it does, looking at it mathmatically, the equation makes it so we have a sin squared plus cosine squared which will equal one leaving the square root of x^2+y^2. and as we have learned before, x^2+y^2 = r^2. then the square root of r^2 is just r, proving the equation

Exercise 2

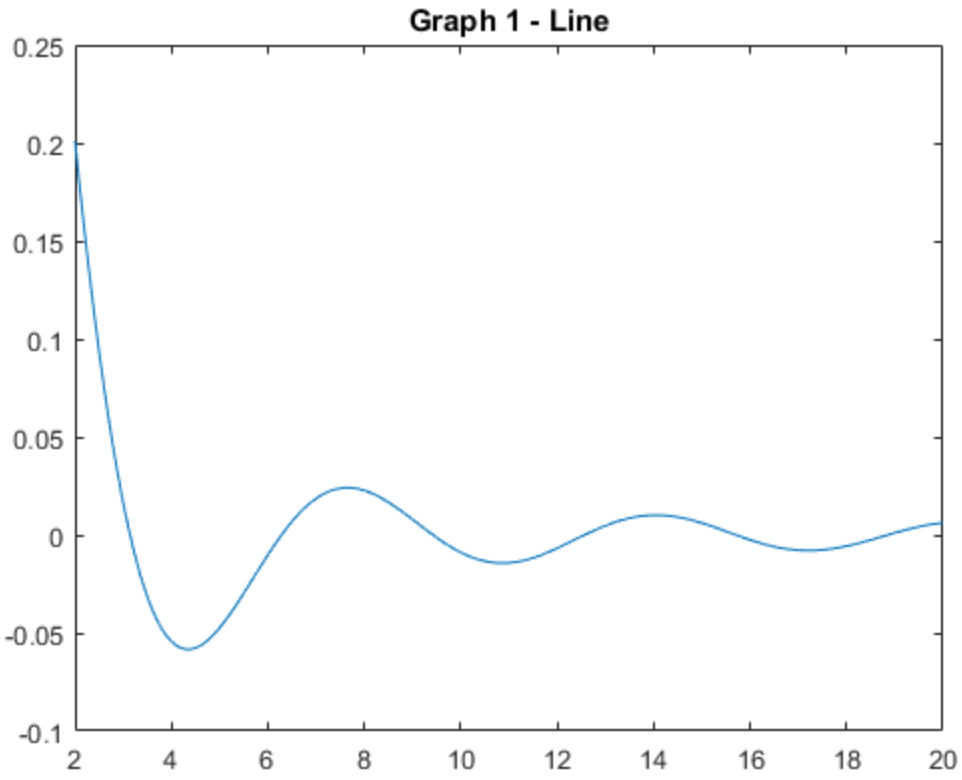
```
% Define t-vector.
```

```
t = 2:0.1:20;

% Define y-vector.
y = exp(t/20).*sin(t)./(t.^2+1);
```

Part (a)

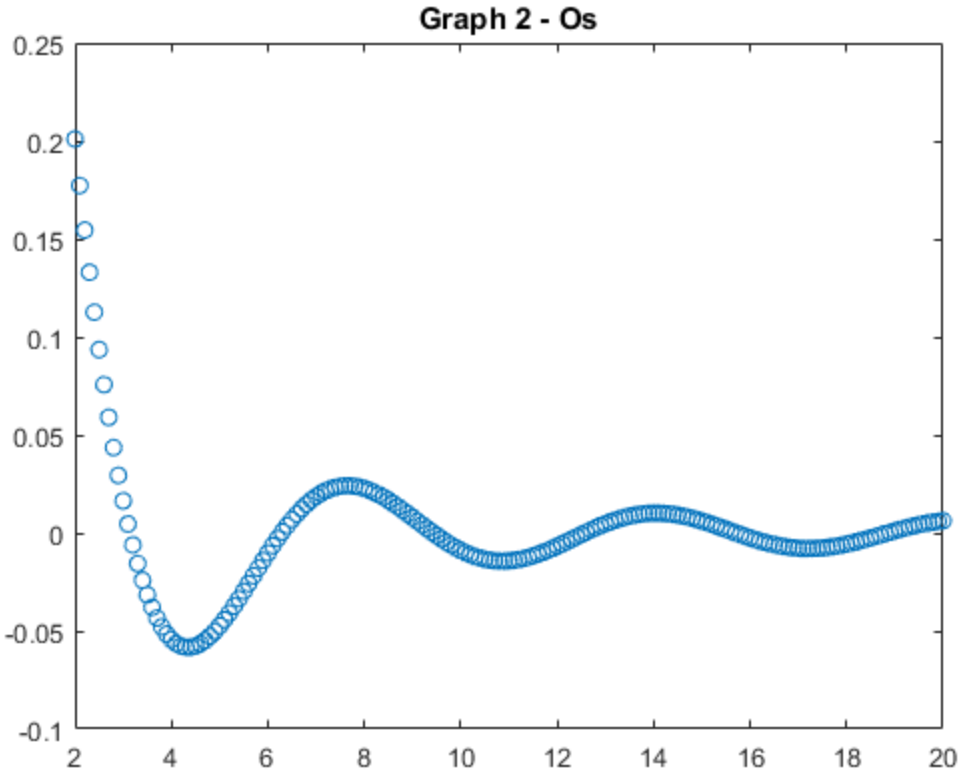
```
% Plot results (should have 3 plots total).
figure;
plot(t,y,'-')
title('Graph 1 - Line')
```

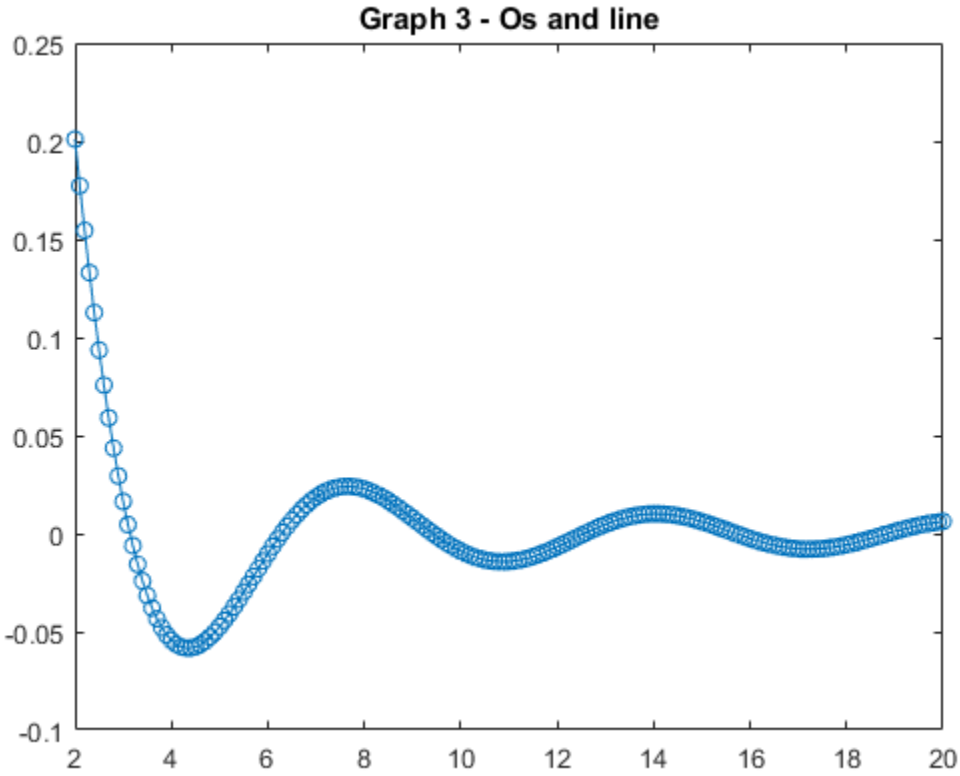


Part (b)

```
% Plot results as data points only and as data points with line.
figure; % creates a new figure window for next plot
plot(t,y,'o');
title('Graph 2 - Os')

figure; % creates another figure window
plot(t,y,'o-');
title('Graph 3 - Os and line')
```


Graph 2 - Os
0.25
0.2
0.15
0.1
0.05
0
-0.05
-0.1
2
4
6
8
10
12
14
16
18
20

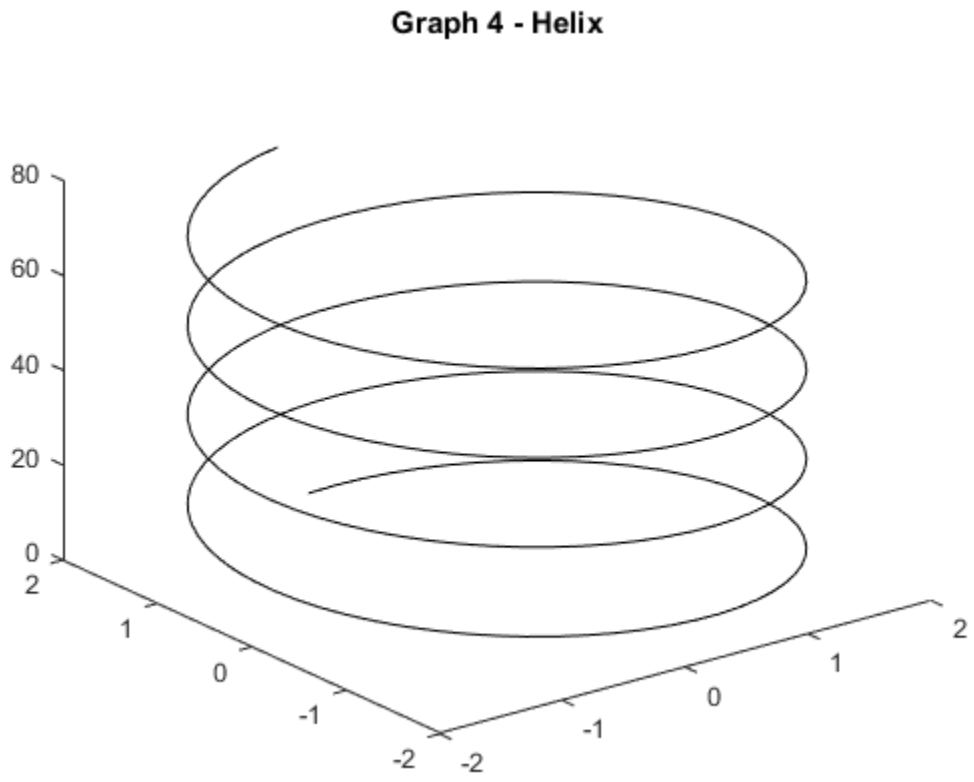

Graph 3 - Os and line
0.25
0.2
0.15
0.1
0.05
0
-0.05
-0.1
2
4
6
8
10
12
14
16
18
20

Exercise 3

```
% Create t-vector (choose enough elements so that plot is smooth!)
t = 0:0.1:25;

% Define x,y,z components in terms of t.
x = 2*sin(t); y = 2*cos(t); z = 3*t;

% Plot resuls.
figure;
grid on;
plot3(x,y,z, 'black');
title('Graph 4 - Helix')
```



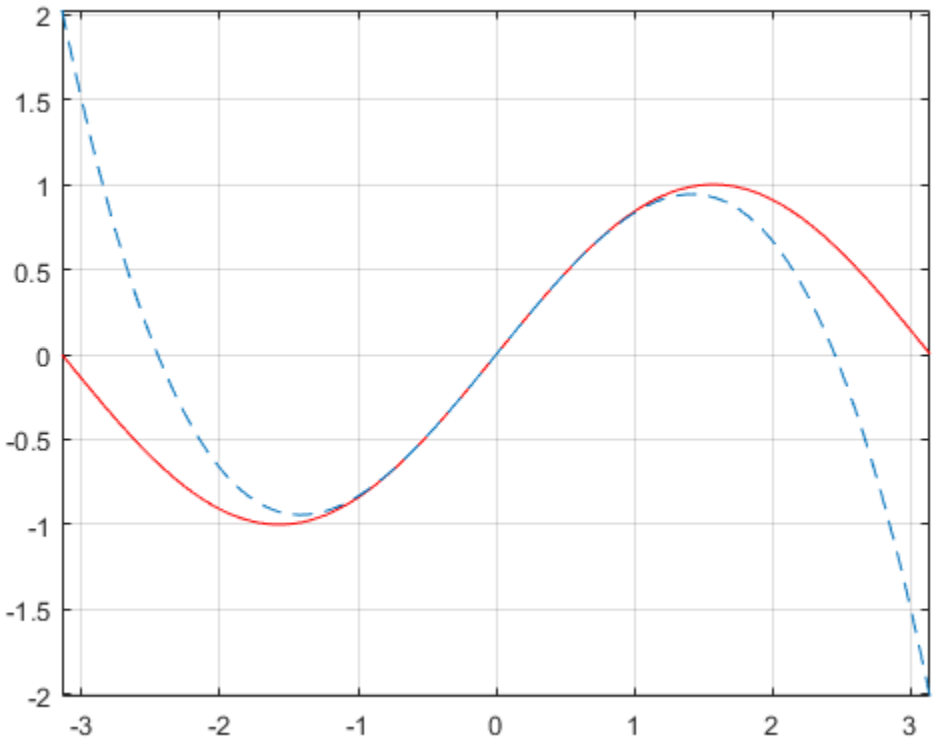
Exercise 4

```
% Define input variable as vector.
x = -pi:0.01:pi;

% Define y and z.
y = sin(x);
z = x- (x.^3/6);

% Plot results.
figure;
```

```
plot(x,y,'r',x,z,'--')
axis tight;
grid on;
```



Exercise 5

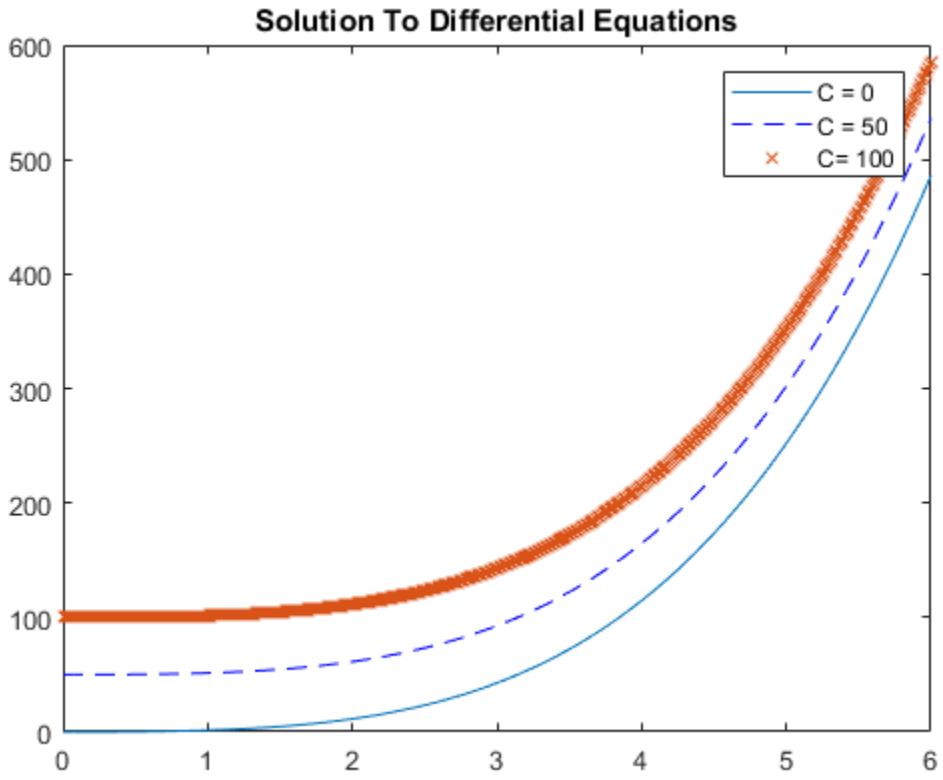
```
% NOTE: you must create the M-file ex5.m separately and invoke it here
 in
% your main M-file (main file).

% Print out the code for your created M-file (do NOT submit M-file
% separately).
type 'ex5.m'

% Run your M-file--i.e., execute the M-file.
run 'ex5.m'


x = 0:0.01:6 ; % define the vector x in the interval [0,5]
y1 = f(x, 0); % compute the solution with C = 0
y2 = f(x, 50); % compute the solution with C = 50
y3 = f(x,100); % compute the solution with C = 100
plot(x,y1, x,y2, '--b', x, y3, 'x') % plot the three solutions with
 different line-styles
title('Solution To Differential Equations') % add a title
legend('C = 0', 'C = 50', 'C= 100') % add a legend
```

```
function y = f(x,C)
y = x.^4/4+(2/3)*x.^3+x.^2/2+C; % fill-in with th e expression for the
 general solution
end
```



Exercise 6

Part (a)

```
% Define f as  anonymous function.
f = @(x,y)(y.^2 + (x*exp(y))/(x.^2+1));

% Evaluate f at the given values of x and y

f(-3,1)
```

```
ans =

    0.1845
```

Part (b)

```
% Clear the function f out of the workspace.
```

```
clear f

% Print out f.m contents.
type 'f.m'

% Evaluate f at the given values of x and y

f(-3,1)
```

```
function [ o ] = f( x, y )

o = x.^2+x.*exp(y)./(y+1);

end
```

```
ans =

    4.9226
```

The End!!!

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