% Michael Dang - 16257750

% MATH345L

% Assignment 2

%Problem 1, complex roots

clear,clc

%Input

y = input('y='); %input for IC of y

dy = input('dy='); %input for IC of y

a = input('a='); %input for a

b = input('b='); %input for b

c = input('c='); %input for c

tmin = input('tmin='); %input for the min

tmax = input('tmax='); %input for the max

%Part 1

m = [a b c];

r = roots(m); %Roots of the char eq

%Part 2

lambda1 = real(r(1));

lambda2 = real(r(2));

mu1 = imag(r(1));

mu2 = imag(r(2));

%Part 3

%print the general sol, with 2 decimal places

fprintf('y(t)= exp^(%.2f\*t)\*{[C1\*cos(%.2f\*t)] + [C2\*sin(%.2ft)]}\n', lambda1, mu1, -mu2);

%Part4

%Find C1 and C2 and substitute in the DE

A = [1 0; lambda1 mu1];

B = [y dy];

x = A/B;

fun = sprintf('y(t) = exp^(%.2d\*t)\*{[%.2f\*cos(%.2f\*t)] + [%.2d\*sin(%.2ft)]}', lambda1, x(1), mu1, x(2), -mu2);

%Part5

%Display the function

disp(fun)

%Part6

%Plot the solution

f = @(t) (x(1) + x(2).\*t).\*exp(mu2\*t) ;

fplot(f,[tmin, tmax]);

grid on;

xlabel('t');

ylabel('y(t)');

title(fun);

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%Problem 2

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a = input('a='); %input for a

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c = input('c='); %input for c

tmin = input('tmin='); %input for the min

tmax = input('tmax='); %input for the max

%Part 1

m = [a b c];

r = roots(m); %Roots of the char eq

%Part 2

%print the general sol,

fprintf('y(t)= C1\*exp^(%.2f\*t) + C2\*%.2f\*exp^(%.2f\*t)\n', r(1), r(1), r(2));

%Find C1 and C2 and substitute in the DE

A = [1 0; r(1) 1];

B = [y dy];

x = A/B;

fun = sprintf('y(t) = %.2f\*exp^(%.2f\*t) + %.2f\*%.2f\*exp^(%.2f\*t)\n', x(1), r(1), x(2), r(2), r(2));

%Part4

%Display the function

disp(fun);

%Part5

f = @(t) (x(1) + x(2).\*t).\*exp(r(2)\*t) ;

fplot(f,[tmin, tmax]);

grid on;

xlabel('t');

ylabel('y(t)');

title(fun);