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```
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%                                PROJECT 2
% NAME: TOMOKI KOIKE
% CLASS: MA266-074
% PROFESSOR: DR. MARIANO
%
% DESCRIPTION: THIS PROGRAM PLOTS THE GRAPH OF A RLC CIRCUIT AND
% WITH DIFFERENT POWER SUPPLY FREQUENCIES
% MOTION OF THE SYSTEM.
%
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
```

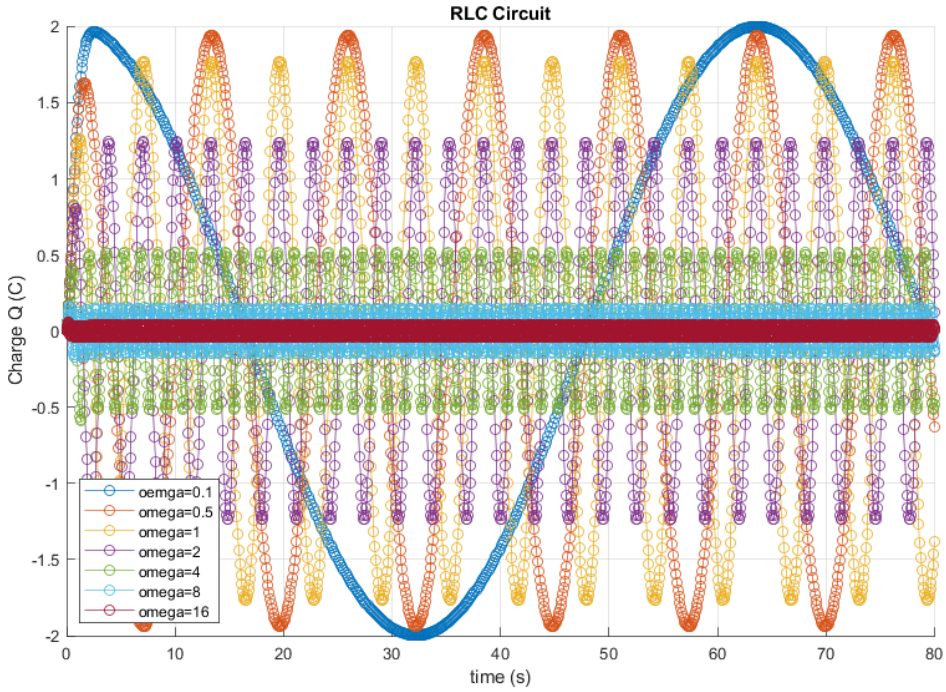
INITIALIZAITON

```
L = 1;     %the inductance
C = 1/5;   %the capacitance
R = 4;     %the resistance
% E = 10*cos(omega*t);  %the power supply
```

QUESTION #1

1. Use ode45 (and plot routines) to plot the solution of (omega) with Q(0) = 0 and Q'(0) = 0 over the interval 0 <= t <= 80 for omega = 0, 0.5, 1, 2, 4, 8, 16.

```
figure('rend','painters','pos',[10 10 900 600])
for omega = [0.1 0.5 1 2 4 8 16]
    [t,q] = ode45(@(t,q) qp(t,q,L,R,C,omega), [0,80], [0;0]);
    % plotting
    hold on
    plot(t,q(:,1),'-o');
    title('RLC Circuit');
    xlabel('time (s)');
    ylabel('Charge Q (C)');
    grid on;
end
legend('oemga=0.1','omega=0.5','omega=1','omega=2','omega=4','omega=8','omega=16',
hold off
```



QUESTIONS

2. Let A(omega) = maximum of `Q(t)` over the interval 30 t <= 80 (this approximates the amplitude of the steady-stat solution). Experiment with various values of ? and discuss what appears to happen to A(omega) as omega - infinity and as omega -> 0. Also, interpret your findings in terms of an equivalent spring-mass system.

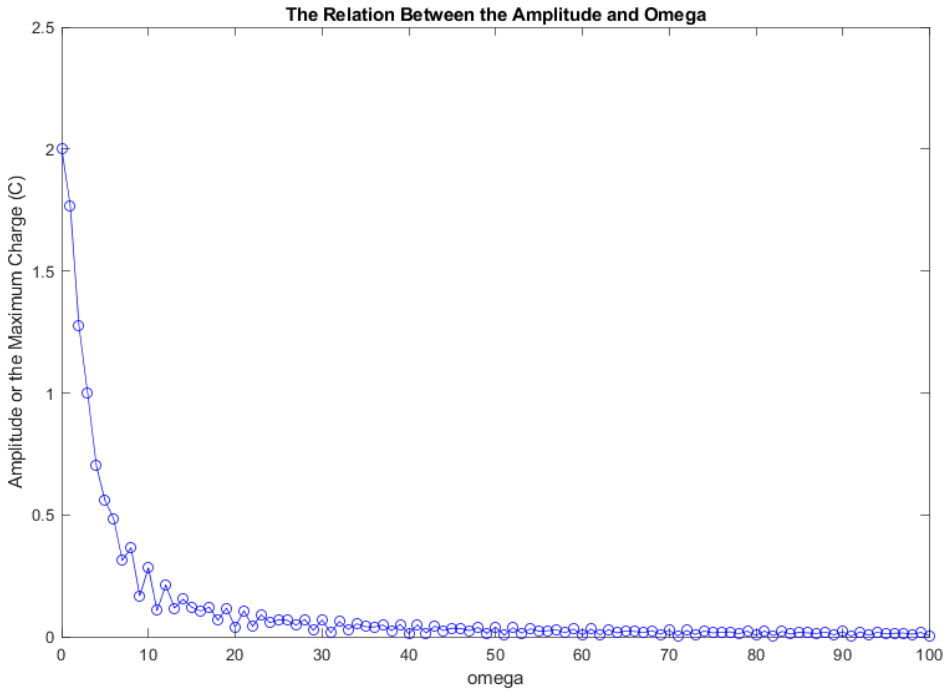
```
%index
n=1;
omega = 0:1:100;
%setting up the vector for the omega and the amplitude
amp_maxVector = zeros(1,numel(omega));
omegaVector = zeros(1,numel(omega));

for omega = 0:1:100
    %solving the diff eqn
    [t,q] = ode45(@(t,q) qp(t,q,L,R,C,omega), [30,80], [0;0]);
    %figuring out the maximum |Q(t)|
    max_q1_q2 = max(q);
    maxq = max_q1_q2(1,1);
    min_q1_q2 = min(q);
    minq = min_q1_q2(1,1);
    abs_minq = abs(minq);
    ampPossibleMax = [maxq, abs_minq];
    amp_max = max(ampPossibleMax);
    %inserting it into the vector
    omegaVector(n) = omega;
    amp_maxVector(n) = amp_max;
    fprintf("n=%d, omega=%f, amp=%f\n",n,omega,amp_max);
```

```
    n = n + 1;
end

plot(omegaVector, amp_maxVector, '-ob');
title("The Relation Between the Amplitude and Omega");
xlabel('omega');
ylabel('Amplitude or the Maximum Charge (C)');

% Analysis
% When the omega goes to infinity for the A(omega) function the result
% asymptotes to 0. And when the omega goes to zero, the result of the
% function becomes 2.
```

```
n=1, omega=0.000000, amp=2.003731
n=2, omega=1.000000, amp=1.767909
n=3, omega=2.000000, amp=1.274929
n=4, omega=3.000000, amp=0.999211
n=5, omega=4.000000, amp=0.702440
n=6, omega=5.000000, amp=0.557732
n=7, omega=6.000000, amp=0.484244
n=8, omega=7.000000, amp=0.313412
n=9, omega=8.000000, amp=0.364354
n=10, omega=9.000000, amp=0.168305
n=11, omega=10.000000, amp=0.282286
n=12, omega=11.000000, amp=0.107691
n=13, omega=12.000000, amp=0.211812
n=14, omega=13.000000, amp=0.117462
n=15, omega=14.000000, amp=0.154071
n=16, omega=15.000000, amp=0.120807
n=17, omega=16.000000, amp=0.105457
n=18, omega=17.000000, amp=0.121007
n=19, omega=18.000000, amp=0.067763
n=20, omega=19.000000, amp=0.117128
n=21, omega=20.000000, amp=0.039497
n=22, omega=21.000000, amp=0.106405
n=23, omega=22.000000, amp=0.042813
n=24, omega=23.000000, amp=0.089701
n=25, omega=24.000000, amp=0.058027
n=26, omega=25.000000, amp=0.069119
n=27, omega=26.000000, amp=0.067625
n=28, omega=27.000000, amp=0.047414
n=29, omega=28.000000, amp=0.070885
n=30, omega=29.000000, amp=0.026283
n=31, omega=30.000000, amp=0.068712
n=32, omega=31.000000, amp=0.016178
n=33, omega=32.000000, amp=0.062959
n=34, omega=33.000000, amp=0.030164
n=35, omega=34.000000, amp=0.052899
n=36, omega=35.000000, amp=0.041188
n=37, omega=36.000000, amp=0.039724
n=38, omega=37.000000, amp=0.048146
n=39, omega=38.000000, amp=0.025180
n=40, omega=39.000000, amp=0.050551
n=41, omega=40.000000, amp=0.012173
```

```
n=42, omega=41.000000, amp=0.048818
n=43, omega=42.000000, amp=0.015081
n=44, omega=43.000000, amp=0.043363
n=45, omega=44.000000, amp=0.025448
n=46, omega=45.000000, amp=0.035098
n=47, omega=46.000000, amp=0.033269
n=48, omega=47.000000, amp=0.024969
n=49, omega=48.000000, amp=0.037893
n=50, omega=49.000000, amp=0.013722
n=51, omega=50.000000, amp=0.039140
n=52, omega=51.000000, amp=0.006376
n=53, omega=52.000000, amp=0.037099
n=54, omega=53.000000, amp=0.015124
n=55, omega=54.000000, amp=0.032037
n=56, omega=55.000000, amp=0.023026
n=57, omega=56.000000, amp=0.024745
n=58, omega=57.000000, amp=0.028601
n=59, omega=58.000000, amp=0.016004
n=60, omega=59.000000, amp=0.031454
n=61, omega=60.000000, amp=0.006892
n=62, omega=61.000000, amp=0.031665
n=63, omega=62.000000, amp=0.007695
n=64, omega=63.000000, amp=0.029057
n=65, omega=64.000000, amp=0.015378
n=66, omega=65.000000, amp=0.024133
n=67, omega=66.000000, amp=0.021441
n=68, omega=67.000000, amp=0.017576
n=69, omega=68.000000, amp=0.025406
n=70, omega=69.000000, amp=0.009963
n=71, omega=70.000000, amp=0.026917
n=72, omega=71.000000, amp=0.003638
n=73, omega=72.000000, amp=0.026088
n=74, omega=73.000000, amp=0.009291
n=75, omega=74.000000, amp=0.023179
n=76, omega=75.000000, amp=0.015493
n=77, omega=76.000000, amp=0.018342
n=78, omega=77.000000, amp=0.020073
n=79, omega=78.000000, amp=0.012227
n=80, omega=79.000000, amp=0.022781
n=81, omega=80.000000, amp=0.005502
n=82, omega=81.000000, amp=0.023340
n=83, omega=82.000000, amp=0.004386
n=84, omega=83.000000, amp=0.021852
n=85, omega=84.000000, amp=0.010437
n=86, omega=85.000000, amp=0.018541
n=87, omega=86.000000, amp=0.015399
n=88, omega=87.000000, amp=0.013834
n=89, omega=88.000000, amp=0.018809
n=90, omega=89.000000, amp=0.008129
n=91, omega=90.000000, amp=0.020496
n=92, omega=91.000000, amp=0.002409
n=93, omega=92.000000, amp=0.020277
n=94, omega=93.000000, amp=0.006153
n=95, omega=94.000000, amp=0.018300
```

```
n=96, omega=95.000000, amp=0.011217
n=97, omega=96.000000, amp=0.014799
n=98, omega=97.000000, amp=0.015149
n=99, omega=98.000000, amp=0.010176
n=100, omega=99.000000, amp=0.017623
n=101, omega=100.000000, amp=0.004899
```



ACADEMIC INTEGRITY

```
PS07_academic_integrity_koike("Tomoki Koike");
```

I am submitting code that is my own original work. I have not used source code, either modified or unmodified, obtained from any unauthorized source. Neither have I provided access to my code to any peer or unauthorized source. Signed,
<Tomoki Koike>

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