
Homework 10 - Steve Mazza

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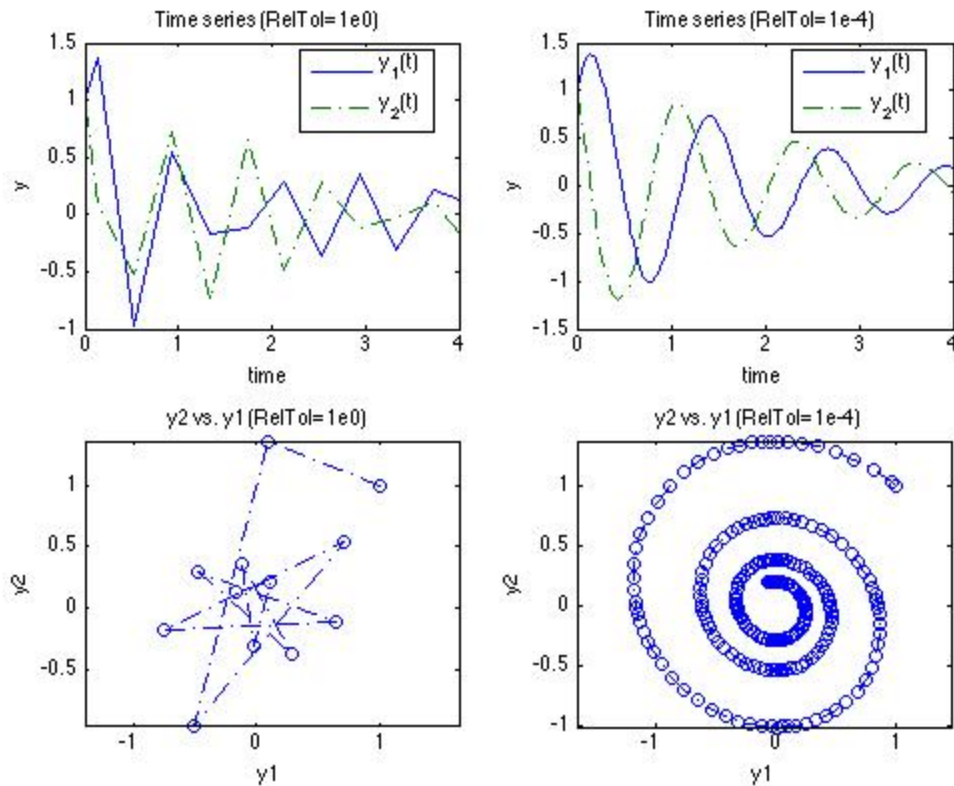
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Problem 1

```
clc; clear all; close all;

options = odeset('RelTol',1e0);
[t0,y0] = ode23(@(t,y)[5*y(2); -5*y(1) - y(2)], [0 4], [1 1], options);
options = odeset('RelTol',1e-4);
[t1,y1] = ode23(@(t,y)[5*y(2); -5*y(1) - y(2)], [0 4], [1 1], options);

% Plot findings.
subplot(2,2,1);
plot(t0,y0(:,1), '-', t0,y0(:,2), '-.');
legend('y_1(t)', 'y_2(t)', 0);
title('Time series (RelTol=1e0)');
xlabel('time');
ylabel('y')
subplot(2,2,2);
plot(t1,y1(:,1), '-', t1,y1(:,2), '-.');
legend('y_1(t)', 'y_2(t)', 0);
title('Time series (RelTol=1e-4)');
xlabel('time');
ylabel('y')
subplot(2,2,3);
plot(y0(:,2), y0(:,1), '-.o');
axis equal;
title('y2 vs. y1 (RelTol=1e0)');
xlabel('y1');
ylabel('y2')
subplot(2,2,4);
plot(y1(:,2), y1(:,1), '-.o');
axis equal;
title('y2 vs. y1 (RelTol=1e-4)');
xlabel('y1');
ylabel('y2')
```



Problem 2

```

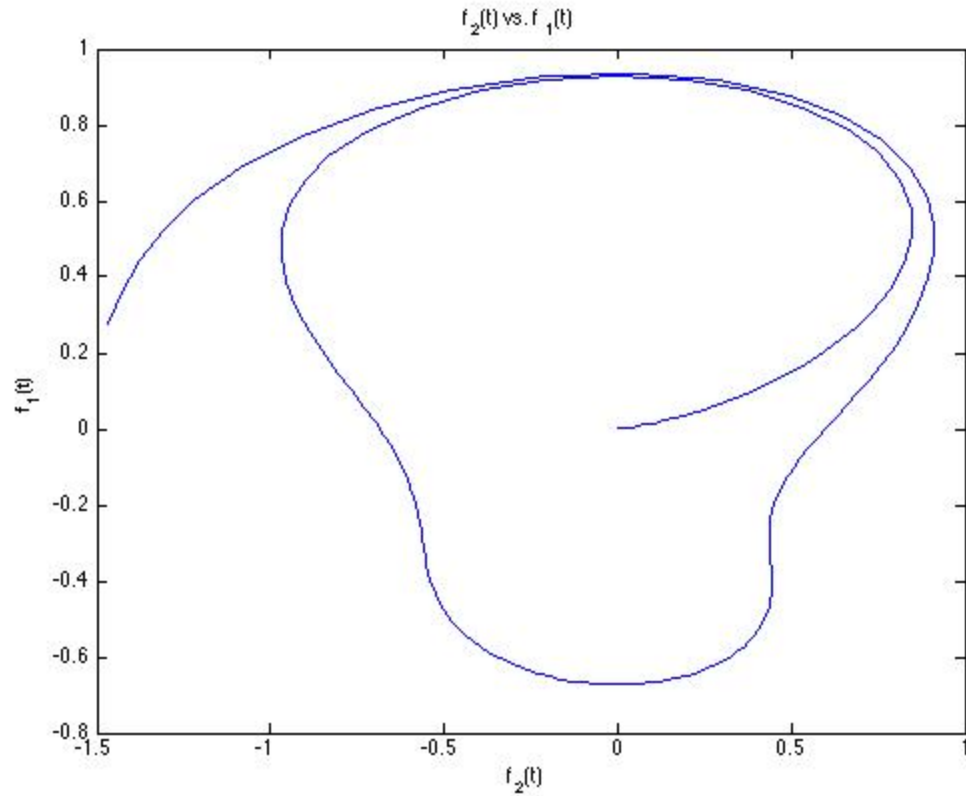
clc; clear all; close all;

[t,y] = ode45(@(t,y)[y(2); y(3); y(4); ...
    -5*(1-y(1))*y(4)-2*y(3)-3*y(2)-y(1)^3+10*sin(pi*t)], ...
    [0 9], [0 0 0 0]);

% Plot the results.
plot(t,y(:,1), ':', t,y(:,2), '--', t,y(:,3), '-.', t,y(:,4), ':');
title('Time vs. F(Time)');
xlabel('time');
ylabel('f(time)');
legend('y_1(t)', 'y_2(t)', 'y_3(t)', 'y_4(t)', 0);

% Plot z2 vs z1.
plot(y(:,2), y(:,1));
title('f_2(t) vs. f_1(t)');
xlabel('f_2(t)');
ylabel('f_1(t)');

```

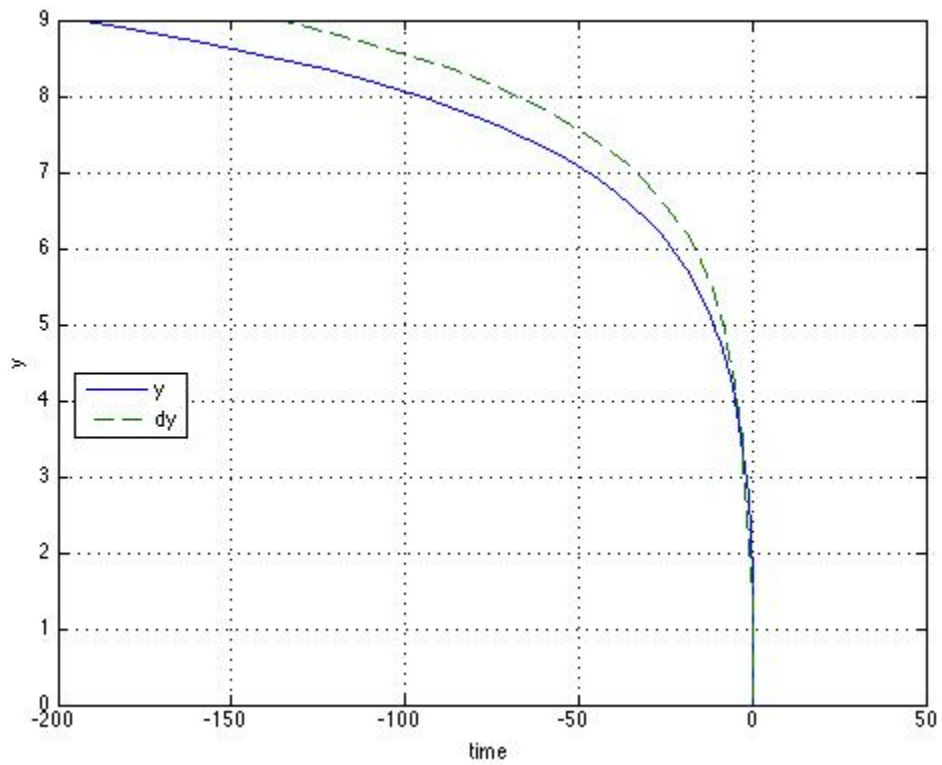
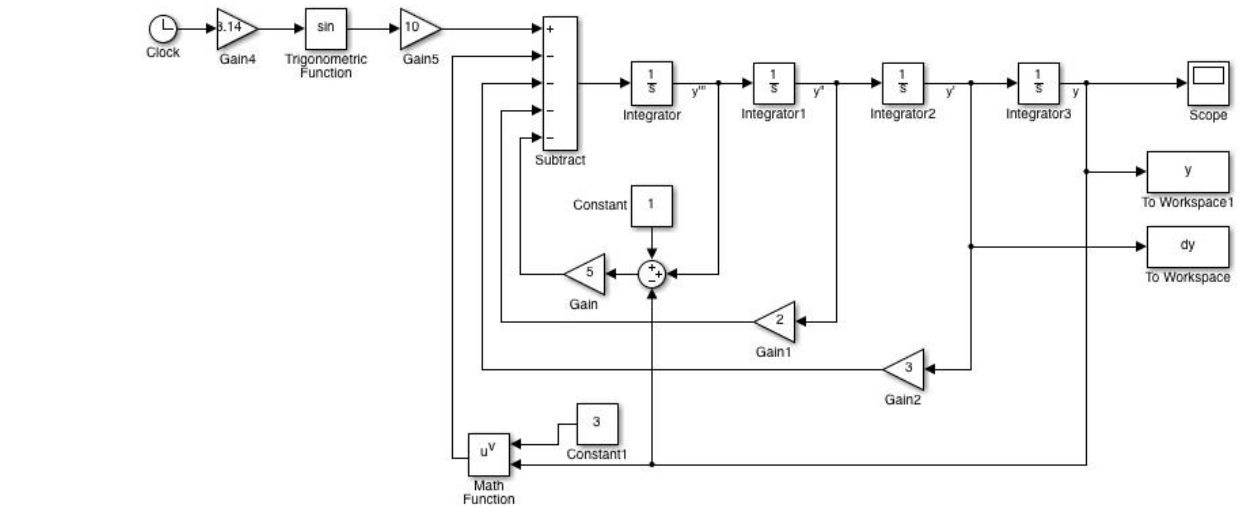


Problem 3

```
clc; clear all; close all; warning off;

open('SE3031HW10_sim_Mazza.slx')
sim('SE3031HW10_sim_Mazza.slx', [0 9])

plot(y,tout,'-',dy,tout,'--');
legend('y','dy',0);
grid;
xlabel('time');
ylabel('y');
```



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