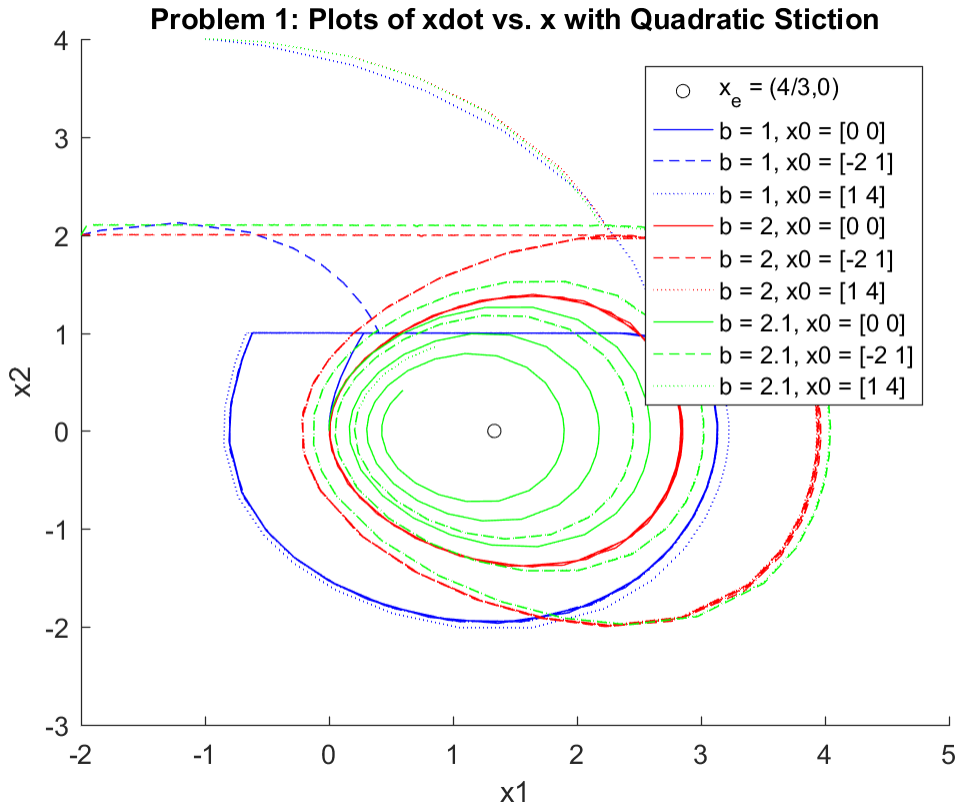
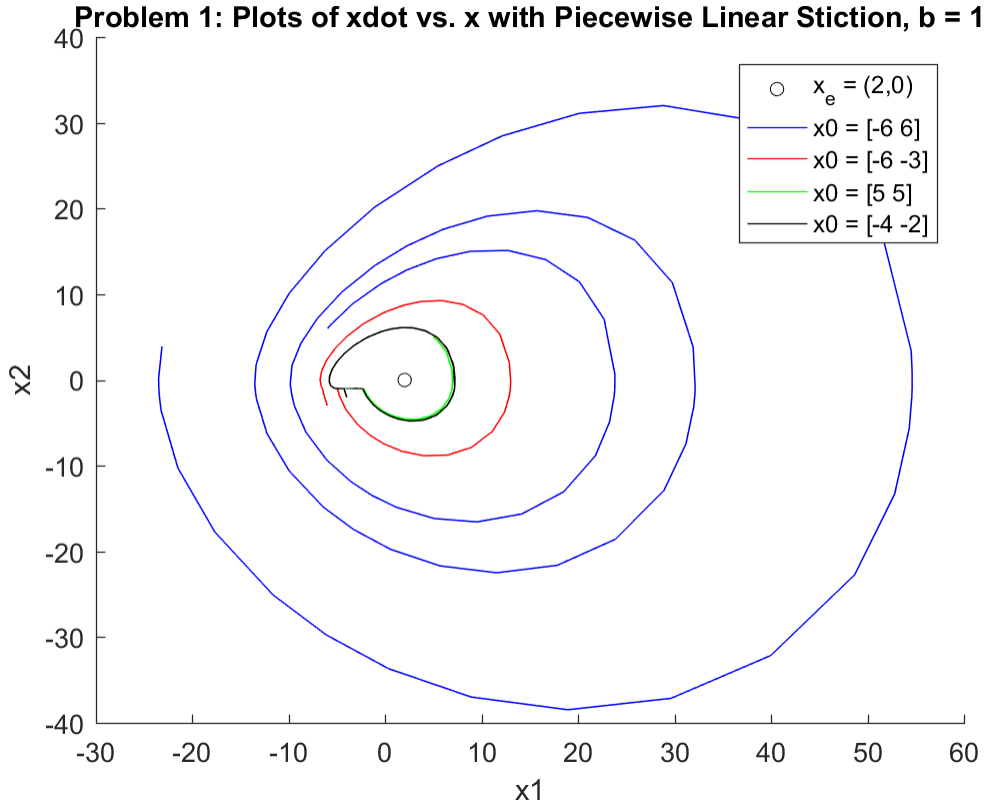
Problem 1

Part 1: Stiction is modeled as quadratic

```
global b
hold on

x0 = [0 0];
x0_2 = [-2 2];
x0_3 = [-1 4];

plot(4/3,0,'ko','MarkerSize',5)

b = 1;
[T,x]=ode23('plant', [0 20], x0);
plot(x(:,1),x(:,2),'b-')

[T,x]=ode23('plant', [0 20], x0_2);
plot(x(:,1),x(:,2),'b--')

[T,x]=ode23('plant', [0 20], x0_3);
plot(x(:,1),x(:,2),'b:')

b = 2;
[T,x]=ode23('plant', [0 20], x0);
plot(x(:,1),x(:,2),'r-')

[T,x]=ode23('plant', [0 20], x0_2);
plot(x(:,1),x(:,2),'r--')

[T,x]=ode23('plant', [0 20], x0_3);
plot(x(:,1),x(:,2),'r:')

b = 2.1;
[T,x]=ode23('plant', [0 20], x0);
plot(x(:,1),x(:,2),'g-')

[T,x]=ode23('plant', [0 20], x0_2);
plot(x(:,1),x(:,2),'g--')

[T,x]=ode23('plant', [0 20], x0_3);
plot(x(:,1),x(:,2),'g:')

% plotting functions
xlabel('x1'); ylabel('x2');
legend('x_e = (4/3,0)','b = 1, x0 = [0 0]','b = 1, x0 = [-2 1]','b =
 1, x0 = [1 4]','b = 2, x0 = [0 0]','b = 2, x0 = [-2 1]','b = 2, x0 =
 [1 4]','b = 2.1, x0 = [0 0]', 'b = 2.1, x0 = [-2 1]', 'b = 2.1, x0 =
 [1 4]');
title('Problem 1: Plots of xdot vs. x with Quadratic Stiction');

%Part 2: Stiction is a piecewise linear function
```

```
hold off
figure
hold on

x0 = [-6 6];
x0_2 = [-6 -3];
x0_3 = [5 5];
x0_4 = [-4 -2];

plot(2,0,'ko','MarkerSize',5)

b = 1;
[T,x]=ode23('plant2', [0 20], x0);
plot(x(:,1),x(:,2),'b-')

[T,x]=ode23('plant2', [0 20], x0_2);
plot(x(:,1),x(:,2),'r-')

[T,x]=ode23('plant2', [0 20], x0_3);
plot(x(:,1),x(:,2),'g-')

[T,x]=ode23('plant2', [0 20], x0_4);
plot(x(:,1),x(:,2),'k-')

% plotting functions
xlabel('x1'); ylabel('x2');
legend('x_e = (2,0)','x0 = [-6 6]','x0 = [-6 -3]','x0 = [5 5]','x0 =
 [-4 -2]');
title('Problem 1: Plots of xdot vs. x with Piecewise Linear Stiction,
 b = 1');
```


Problem 1: Plots of xdot vs. x with Quadratic Stiction
x2
x1
x_e = (4/3,0)
b = 1, x0 = [0 0]
b = 1, x0 = [-2 1]
b = 1, x0 = [1 4]
b = 2, x0 = [0 0]
b = 2, x0 = [-2 1]
b = 2, x0 = [1 4]
b = 2.1, x0 = [0 0]
b = 2.1, x0 = [-2 1]
b = 2.1, x0 = [1 4]


Problem 1: Plots of xdot vs. x with Piecewise Linear Stiction, b = 1
x2
x1
x_e = (2,0)
x0 = [-6 6]
x0 = [-6 -3]
x0 = [5 5]
x0 = [-4 -2]

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