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# HW04 - Q01 - Vector Fields, Flows, First Integrals

@author: Bardia Mojra @date: 10/14/2021 @title HW03 - Q01 - First Integral of Motion for Undamped Oscillator @class ee5323 - Nonlinear Systems @professor - Dr. Frank Lewis

```
clc
clear
close all
warning('off','all')
warning

x0_set = -2:.5:2;
t_intv= [0 20];
x_0= [0.1, 0]'; % initial conditions for x(t)
figure
[t,x]= ode23('q01_sys', t_intv, x_0);
plot(t,x)
hold on;
grid on;
title('First Integral of Motion for Undamped Oscillator - Time Plot');
ylabel('X(t)');
xlabel('t (sec)');
legend('$x(t)$', '$\dot{x}(t)$', 'Interpreter', 'latex');
```

```
clc
clear
close all
[x1,x2] = meshgrid(-10:1:10,-10:1:10);
dx1=[];
dx2=[];
N=length(x1);
for i=1:N;
    for j=1:N;
        dx = q01_sys(0, [x1(i,j);x2(i,j)]);
    end
end
figure(1);
quiver(x1,x2,dx1,dx2);
```

*All warnings have the state 'off'.*

Error using quiver (line 58)  
The size of X must match the size of U or the number of columns of U.

Error in hw04\_q01\_code (line 40)  
quiver(x1,x2,dx1,dx2);

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