clc

clear all

% parameters

friction = 0.12;

gravity = 9.81;

mass = 2;

spring\_const = 1000;

r0 = 0.1;

tspan = [0 1];

% initial conditions

y0 = [1.5\*r0; 0]; % [pos, vel]

% call ode45 function

[t, y] = ode45(@(t, y) mass\_eom(t, y, friction, gravity, mass, ...

spring\_const), tspan, y0);

position\_vector = y(:, 1);

velocity\_vector = y(:, 2);

r\_max = max(position\_vector)

r\_min = min(position\_vector)

rdot\_max = max(velocity\_vector)

rdot\_min = min(velocity\_vector)

% plots

figure(1)

plot(t, position\_vector)

title('Position vs Time')

xlabel('Time (s)')

ylabel('Position (m)')

figure(2)

plot(t, velocity\_vector)

title('Velocity vs Time')

xlabel('Time (s)')

ylabel('Velocity (m/s)')

% eom function

function ydot = mass\_eom(t, y, mu, g, m, k)

pos = y(1);

vel = y(2);

theta = 1.2\*sin(6.5\*t);

theta\_dot = 7.8\*cos(6.5\*t);

theta\_ddot = -50.7\*sin(6.5\*t);

rdot = vel;

rddot = -(2\*mu\*theta\_dot\*rdot + theta\_ddot\*mu\*pos + ...

mu\*g\*cos(theta))\*sign(rdot) + theta\_dot^2\*pos - ...

g\*sin(theta) - k\*pos/m;

ydot = [rdot; rddot];

end

Chart, line chart

Description automatically generatedChart, line chart

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