

Ch_8_Lesson_7_Ex_4

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clear

m = 100; % mass of box
k = 1000; % spring constant
c = 20; % damping coefficient
L = 2; % position of top of spring when r(t) = 0 and spring relaxed

dt = 0.001;
n=10000;

% program a bump in the road
r=zeros(n+1,1);
for i=3001:3500 % that happens at t=3, and lasts 0.5 seconds
    r(i) = 0.1; % with height = 10cm
end

p(1) = 1; % starting height of box, at equilibrium position
v(1) = 0; % starting velocity of box
t(1) = 0;

for i=2:n+1
    t(i) = t(i - 1) + dt;

    p(i) = p(i-1)+v(i-1)*dt;

    vr = (r(i) - r(i-1))/dt; % estimate r' at t(i - 1)

    % the forces on the box are spring, damper and gravity
    a = (-k*(p(i-1) - r(i-1) - L) - c*(v(i-1) - vr))/m - 10;

    v(i) = v(i-1) + a*dt;
end

plot(t, p)
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