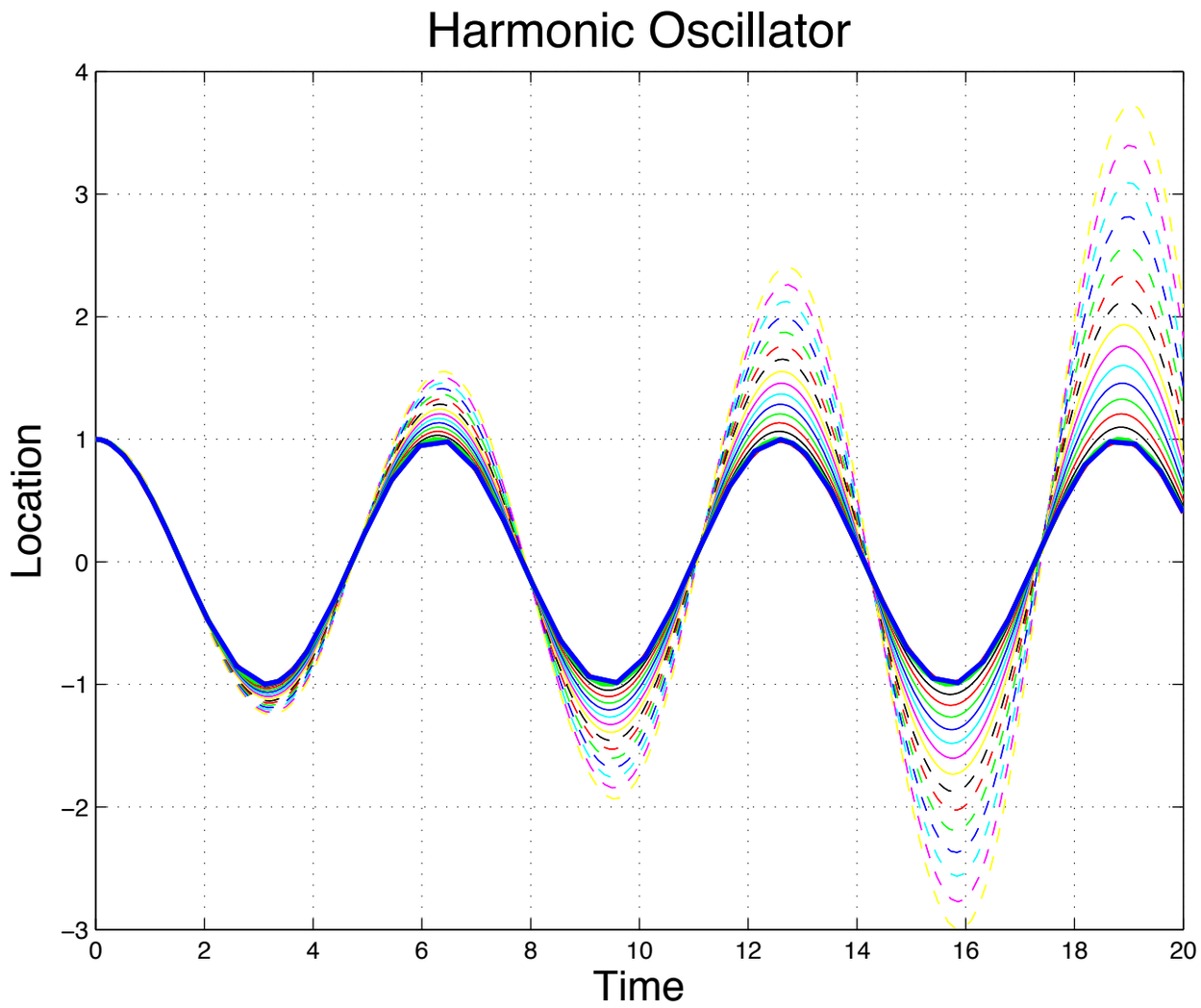
Homework 4: ODEs

1. Write your own Euler solution and vary the step size as described on the next page.
2. Solve the same ODEs by calling ODE23, ODE45, ODE113 overlay on the Euler solutions like on the plot to the right.
3. Comment on the results.



```
clear;clc

% Initial time
t0=0;

% Final time
tfinal=20;

% Initial location
y0=[1;0];

% Symbols
line={'-k' '-r' '-g' '-b' '-c' '-m' '-y' '--k' '--r' '--g' '--b' '--c' '--m' '--y'};


for jsize=1:length(line)

    % step size
    h=0.01*jsize;

    % initial conditions
    t=t0;
    y=y0;

    % Write Euler Solution here



    % Plot Euler solution for this time step
    linestyle=char(line{jsize});
    plot(tplot,yplot,linestyle);
    clear tplot yplot
    if jsize==1
        hold on
    end


end
hold off

xlabel('Time','FontSize',17)
ylabel('Location','FontSize',17)
title('Harmonic Oscillator','FontSize',20)
grid on
xlim([0 20])

fn='sho-euler';
wrplotepsjpeg(fn)
```

As the step size increased so did the error! Why?