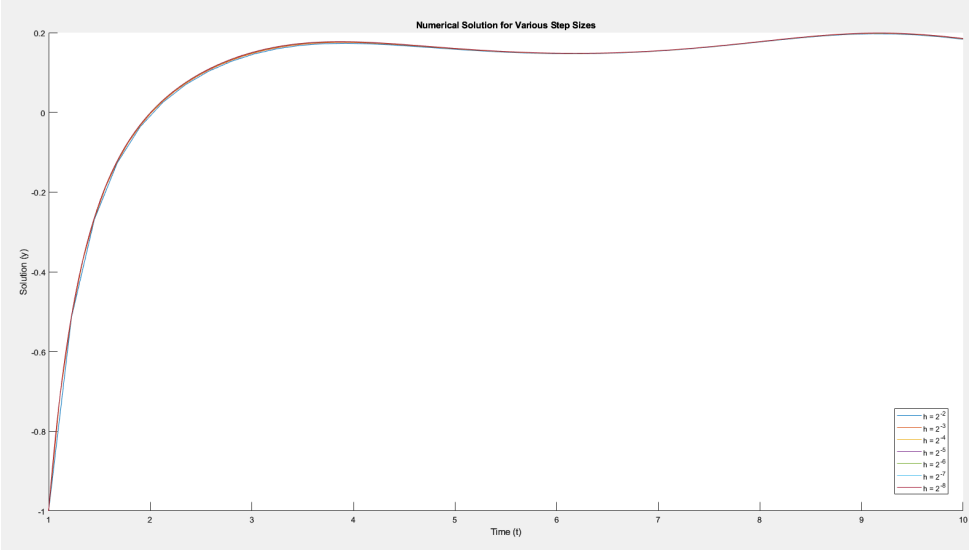
```
f = @(t,y) 1/t^2 - y/t + sin(t)*y^2;
y0 = -1;
T = 10;
h_list = 2.^(-[2:8]);
err_list = zeros(size(h_list));
for i=1:length(h_list)
   h = h_list(i);
   N = ceil(T/h);
   t = linspace(1,T,N+1);
   y = zeros(size(t));
   y(1) = y0;
   for j=1:N
       k1 = f(t(j), y(j));
       k2 = f(t(j) + h/2, y(j) + h/2*k1);
       k3 = f(t(j) + h/2, y(j) + h/2*k2);
       k4 = f(t(j) + h, y(j) + h*k3);
       y(j+1) = y(j) + h/6*(k1 + 2*k2 + 2*k3 + k4);
   end
   err_list(i) = abs(y(end) - (1+log(T))^(-1));

   fprintf('h = 2^-%d: y(%d) = %f\n', i+1, T, y(end));
end
p_list = zeros(size(err_list));
for i=2:length(err_list)-1
   p_list(i) = log(err_list(i-1)/err_list(i)) / log(h_list(i-1)/h_list(i));
   p_list(i) = (p_list(i) + log(err_list(i)/err_list(i+1)) /
log(h_list(i)/h_list(i+1))) / 2;
end
fprintf('Order of accuracy:\n');
for i=2:length(p_list)-1
   fprintf('h = 2^-%d: p = %f\n', i+1, p_list(i));
end
```

h = 2^-2: y(10) = 0.035113
h = 2^-3: y(10) = 0.039258
h = 2^-4: y(10) = 0.040408
h = 2^-5: y(10) = 0.040779
h = 2^-6: y(10) = 0.040885
h = 2^-7: y(10) = 0.040912
h = 2^-8: y(10) = 0.040919
Order of accuracy:
h = 2^-3: p = 4.666210
h = 2^-4: p = 3.993804
h = 2^-5: p = 3.999286
h = 2^-6: p = 3.999882
h = 2^-7: p = 3.999970


Numerical Solution for Various Step Sizes
Solution (y)
Time (t)
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
1
2
3
4
5
6
7
8
9
10
h = 2^-2
h = 2^-3
h = 2^-4
h = 2^-5
h = 2^-6
h = 2^-7
h = 2^-8