

test_numerical_solvers

June 11, 2021

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[ ]: #Define right hand side in  $u'=f(t,u)$   
def f(t,u):  
    return sin(u)-t*u
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[ ]: #Set initial time, initial value for  $u(0)$ , final time, and stepsize "h".  
init_time = 0.0  
initu = 1.0  
finaltime = 5.0  
h = 0.1
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[ ]: #Load in Euler's method subroutine, execute  
load('euler_method.sage')  
euler_results = euler_method(f,[init_time,initu],h,finaltime)
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[ ]: #Load in improved Euler method subroutine, execute  
load('imp_euler.sage')  
impeuler_results = imp_euler(f,[init_time,initu],h,finaltime)
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[ ]: #Load in RK4 routine, execute  
load('rk4_method.sage')  
rk4_results = rk4_method(f,[init_time,initu],h,finaltime)
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[ ]: #Plot results for each solver  
p1 = line(euler_results,rgbcolor=[1,0,0],legend_label='Euler method')  
p2 = line(impeuler_results,rgbcolor=[0,1,0],legend_label='Improved Euler')  
p3 = line(rk4_results,rgbcolor=[0,0,0],legend_label='RK4')  
p = p1+p2+p3  
p.set_legend_options(loc='upper center');  
p.axes_labels(['$t$', '$u(t)$'])  
show(p)
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