DEPARTMENT OF MATHEMATICS, I.I.T. GUWAHATI

MA 322: Scientific Computing Lab - XI

1. Use the methods mentioned below to approximate the solutions to each of the following initial-value problems, and compare the results to the actual values.

   (a) $y' = 1 + y/t + (y/t)^2$, $1 \leq t \leq 3$, $y(1) = 0$ with $h = 0.2$; actual solution $y(t) = t\tan(\ln t)$.

   (b) $y' = -ty + 4ty^{-1}$, $0 \leq t \leq 1$, $y(0) = 1$ with $h = 0.1$; actual solution $y(t) = \sqrt{4 - 3e^{-t^2}}$.

   1. Implicit-Euler method
   2. Second and Fourth-order Runge-Kutta methods

2. Solve the initial-value problem $y' = \cos(2t) + \sin(3t)$ by Fourth-order Runge-Kutta method. Take $h = 0.25$ and compare the results to the actual values. $\left(\text{actual solution } y(t) = \frac{1}{2}\sin(2t) - \frac{1}{3}\cos(3t) + \frac{4}{3}\right)$