MA311 (Scientific computing)-IITG

25-10-18

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1. The initial-value problem

$$y' = e^y, \quad 0 \leq t \leq 0.20, \quad y(0) = 1$$

has solution $y(t) = 1 - ln(1 - et)$. applying the three-step Asams-Moulton method to this problem is equivalent to finding the fixed point w_{i+1} of

$$g(w) = w_i + \frac{h}{24}(9e^w + 19e^{w_i} - 5e^{w_{i-1}} + e^{w_{i-2}}).$$

(a) With $h = 0.01$, obtain w_{i+1} by functional iteration for $i = 2, \cdots, 19$ using exact starting values w_0, w_1, w_2. At each step use w_i to initially approximate w_{i+1}.

(b) Will newton's method speed the convergence over functional iteration?

(c) Apply Adams fourth-order predictor-corrector method with $h = 0.1$ and starting values from the Runge-Kutta fourth order method to compute the solution at $t = 0.2$. Compare this method with the Adams-Moulton three step method, by printing the error table. Also compute the order of convergence of both the methods and compare.