

Assignment 5

Numerical Methods, 2024 Spring

Due on Jun 13

Note: You should explain how you obtain your solution in your submission. If you use MATLAB or any other software to compute your results, you should provide your code or describe your solving process. This is a good practice for you to explain things in a logical, organized, and concise way! **Please hand in your assignment with clear photos or scans to the E3 website.**

1. (20%) Solve $y' = \sin(x) + y$, $y(0) = 2$ by the modified Euler method to get $y(0.1)$ and $y(0.5)$. Use a value of h small enough to be sure that you have five digits correct.
2. (20%) Derive the formula for the second-order Adams method. Use the method of undetermined coefficients.
3. (30%) For the third-order equation

$$y''' + ty' - 2y = t, \quad y(0) = y''(0) = 0, \quad y'(0) = 1$$

- (a) Solve for $y(0.2)$, $y(0.4)$, $y(0.6)$ by RKF.
 - (b) Advance the solution to $t = 1.0$ with the Adams-Moulton method.
4. (30%) Solve through finite differences with four subintervals:

$$\frac{d^2y}{dx^2} + y = 0, \quad y'(0) + y(0) = 2,$$

$$y'(\frac{\pi}{2}) + y(\frac{\pi}{2}) = -1$$