

Differential Equations
Homework 6
Due Mar. 13, 2024, 9:59 am

Note:

- Please show all of your work (writing a list of answers is not sufficient).
- Please indicate the people you worked with.
- **Please staple your HW.**
- Several random problems will be graded (1 point each).

1. Solve the initial value problem using Euler's method with $h = 0.1$

$$y' = 3 + x - y, \quad y(0) = 1, \quad 0 \leq x \leq 0.5$$

2. Solve the initial value problem using Euler's method with $h = 0.1$

$$y' = 2y - 1, \quad y(0) = 1, \quad 0 \leq x \leq 0.5$$

3. Verify that y_1 and y_2 are solutions of the differential equation. Then find a particular solution of the form $y = c_1y_1 + c_2y_2$ that satisfies the given initial conditions.

$$y'' - y = 0, \quad y_1 = e^x, \quad y_2 = e^{-x}, \quad y(0) = 0, \quad y'(0) = 5$$

4. Verify that y_1 and y_2 are solutions of the differential equation. Then find a particular solution of the form $y = c_1y_1 + c_2y_2$ that satisfies the given initial conditions.

$$y'' + 6y' + 13y = 0, \quad y_1 = e^{-3x} \cos 2x, \quad y_2 = e^{-3x} \sin 2x, \quad y(0) = 2, \quad y'(0) = 0$$

5. Verify that y_1 and y_2 are solutions of the differential equation. Then find a particular solution of the form $y = c_1y_1 + c_2y_2$ that satisfies the given initial conditions.

$$x^2y'' - xy' + y = 0, \quad y_1 = x, \quad y_2 = x \ln x, \quad y(1) = 7, \quad y'(1) = 2$$