Elementary Differential Equations (MATH200)
2^{nd} Week Homework

Problem 1(2.4-1). Determine (without solving the problem) an interval in which the solution of the given initial value problem is certain to exist.

$$(t-5)y' + (\ln t)y = 2t,\ \ y(1) = 2$$

Problem 2(2.4-2). Determine (without solving the problem) an interval in which the solution of the given initial value problem is certain to exist.

$$y' + (\tan t)y = \sin t,\ \ y(2\pi) = 0$$

Problem 3(2.4-5). State where in the ty-plane the hypotheses of Theorem 2.4.2 are satisfied.

$$y' = (4 - t^2 - y^2)^{1/2}$$

Problem 4(2.6-1). Determine whether the equation is exact. If it is exact, find the solution.

$$(4x + 3) + (6y - 1)y' = 0$$

Problem 5(2.6-2). Determine whether the equation is exact. If it is exact, find the solution.

$$(3x - y) + (x - 3y)y' = 0$$

Problem 6(2.6-3). Determine whether the equation is exact. If it is exact, find the solution.

$$(6x^2 - 2xy + 4) + (6y^2 - x^2 + 2)y' = 0$$

Problem 7(2.7-3). For the given equation, follow these statements.

a. Find approximate values of the solution of the given initial value problem at t=0.1, 0.2, 0.3, and 0.4 using the Euler method with h=0.1.

b. Repeat part **a** with h=0.05. Compare the results with those found in **a**.

c. Repeat part *a* with h=0.025. Compare the results with those found in **a** and **b**.

d. Find the solution $y = \phi(t)$ of the given problem and evaluate $\phi(t)$ at t=0.1, 0.2, 0.3 and 0.4. Compare these values with the results of **a**, **b**, and **c**.

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

Problem 8(2.8-2). Transform the given initial value problem into an equivalent problem with the initial point at the origin.

$$dy/dt = 4 - y^3,\ y(-1) = 2$$

Problem 9(2.8-7). Let $\phi_0(t) = 0$ and use the method of successive approximations to approximate the solution of the given initial value problem.

a. Calculate $\phi_1(t), \ldots, \phi_3(t)$

b. Plot $\phi_1(t),\ \ldots,\ \phi_3(t)$. Observe whether the iterates appear to be converging.

$$y' = 2t^2 + y^2,\ y(0) = 0$$

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