

Math 2233 Homework Set 1

1.

(a) Plot the direction field for the differential equation

$$y' = y^{4/5}.$$

(b) Sketch the solution that satisfies $y(0) = 2$.

(c) Sketch the solution that satisfies $y(0) = 1$.

2. Use Maple to generate direction fields for the following differential equations on the given interval.

(a) $y' = 2y$; $-2 \leq x \leq 2$, $0 \leq y \leq 6$.

(b) $y' = 3y(1 - y)$; $-2 \leq x \leq 3$, $-3 \leq y \leq 4$.

3. For the differential equation in Problem 2(b), what can you say about the behavior of solutions as $x \rightarrow \infty$?

4. Using the Euler Method, find an approximate value for $y(1)$ for the following initial value problem (take $h = \Delta x = 0.02$):

$$\frac{dy}{dx} = x + y \quad , \quad y(0) = 1$$

5. Using the Euler Method, find an approximate value for $y(1)$ for the following initial value problem (take $h = \Delta x = 0.1$):

$$\frac{dy}{dx} = xe^y \quad , \quad y(0) = 0$$

6. Find the first four terms of the Taylor expansion about $x = 0$ of the solution of

$$\begin{aligned} y' &= y^2 \\ y(0) &= 1 \end{aligned}$$

7. Find the first four terms of the Taylor expansion about $x = 1$ of the solution of

$$\begin{aligned} y' &= x^2 \\ y(1) &= 1 \end{aligned}$$