Suggested problems: Sec 1.1 # 8, 10, 11, 17, 18, 23; Sec. 1.3 # 1, 2, 5, 6, 8, 11; Sec 2.2 # 3, 6, 8, 9, 12, 16

Note: We will do 2.2 this week and 2.1 the following week.

This homework is pretty easy, but don’t worry, I promise you’ll be getting much more difficult homework problems in the following weeks.

Mandatory problems:

(1) [7pts] Sketch the direction field for \( y' = y(3 - y) - 2 \) (careful, think about it first, don’t jump right into it; just checking signs won’t work for this). What happens as \( t \to \infty \) (i.e. outline the behavior for various domains)?

(2) [2pts each] What is the order of the following ODEs and state if it is linear or nonlinear.

- a) \( y^2 y' = t \)
- b) \( yy'' = t \)
- c) \( y'' - 2ty' + t^2 y = 2 \)

(3) Consider the IVP \( y' = ty(4 - y)/3, \ y(0) = y_0 \)

(a) [8pts] Solve the IVP.

(b) [2pts] How does the behavior of the solution depend on the initial value \( y_0 \) as \( t \) increases?

(c) [2pts] Suppose \( y_0 = 0.5 \). Find the time \( T \) at which the solution first reaches the value \( y = 3.98 \).

A word on how the grading will work: Let \( m \) be the number of suggested problems, \( n \) the number of suggested problems completed, \( M \) the total number of points for the mandatory problems, and \( N \) the number of points earned for the mandatory problems. Then your homework score is: 

\[
\frac{n}{2m} \cdot M + \left( 1 - \frac{n}{2m} \right) \cdot \left( \frac{N}{M} \right).
\]

Just be glad it’s not a differential equation.