

Supplementary problems: Sec 2.2 # 2, 4, 6, 8, 10, 24, 26, 28

Compulsory problems:

- (1) [7pts] Sketch the direction field for $y' = y(3 - y) - 2$. What happens as $t \rightarrow \infty$ (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.

$$\text{a) } y^2 y' = t; \quad \text{b) } yy'' = t; \quad \text{c) } y'' - 2ty' + t^2 y = 2;$$

- (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 supplementary problems, n the number of supplementary problems completed, M the total number of points for the compulsory problems, and N the number of points earned for the compulsory problems. Then your homework score is: $\frac{n}{2m} \cdot M + \left(1 - \frac{n}{2m}\right) \cdot N = N + \frac{n}{2m}(M - N)$. Just be glad it's not a differential equation.