Homework Assignment 4

Due *Friday, October 4.*

1. Consider the differential equation
$$\frac{dy}{dt} = y(y^2 + \mu y + 1).$$
The equation contains a parameter μ.

   You can use Maple to create the graphs in this problem (but you don't have to).

   (a) For each of the following values of μ, (i) sketch the graph of $\frac{dy}{dt}$ vs. y, (ii) find and classify the equilibria, and (iii) sketch the phaseline:
$$\mu = -2.5, \quad \mu = -1, \quad \mu = 1, \quad \text{and} \quad \mu = 2.5.$$

   (b) Determine the bifurcation values of μ, and describe the change in qualitative behavior of the solutions at each bifurcation value.

   (c) Sketch of bifurcation diagram. That is, make a plot of the y values of the equilibria versus μ. (Examples of bifurcation diagrams are shown in Figures 1.81. 1.83, and 1.88 in the text.)

Text Problems:

- Section 1.7/ 2, 12
- Section 1.8/ 2, 3, 6, 10, 14, 26

Note: Reread pages 104–107 before starting 1.7/12.