HOMEWORK 3

Due: 09/19/2016

1. Textbook Exercises

2.7: 7, 15 [Note: For both questions, you may choose to put your answer in a single Mathematica program. I recommend using Mathematica 10, whose activation key can be obtained from the Duke Software Licensing website. Once finished, name the file as: **[YourName]-EM.nb**, and turn it in through email.]
3.1: 7, 28
3.3: 18, 34, 35
3.4: 18, 21, 25
3.5: 5, 17
3.6: 3, 5, 15, 18

2. Additional Questions

A1. (a) Find a function $f(y)$, such that the autonomous first order ODE

$$y' = f(y)$$

has two unstable equilibria and one stable equilibrium.

(b) For an autonomous equation in general, is it possible to have two *consecutive* (i.e., they are distinct and there is no equilibrium in between) equilibria that are *both* asymptotically stable or unstable? Explain.

A2. Find a fundamental set of solutions for the third order ODE:

$$y''' + 3y'' - y' - 3y = 0.$$

[Hint: The idea for solving constant coefficient homogeneous second order linear ODEs also applies here.]

A3. Practice Exercise 35 in Prof. Nolan's *Additional Homework Problems* with a classmate. No need to turn-in.