Math 339 - Dynamical Systems
Assignment # 1
due Fri September 15th, 12:30pm

Instructions: You are being evaluated on the presentation, as well as the correctness, of your answers. Try to answer questions in a clear, direct, and efficient way. Sloppy or incorrect use of technical terms will lower your mark.

Exercises are on page 36.

1. Exercise 1.2, (a)-(c)

2. Exercise 1.5

3. Consider the map $f(x) = rx^2 e^{-5x}$. This map has a pitchfork bifurcation at a value of r between 20 and 45. We will denote this critical value as r_c.

   (a) Obtain the transcendental equation that gives the value of r at which the pitchfork bifurcation occurs.

   (b) Estimate the bifurcation value r_c. *Hint: You can do this approximately using excel, or more accurately using a root-finding routine such as fzero in Maple.*

   (c) Using excel (or equivalent), verify that the map has one fixed point for $r < r_c$, and two fixed points for $r > r_c$. Sketch or plot the bifurcation diagram.