Rutgers University
The State University Of New Jersey
College of Engineering
Department of Electrical and Computer Engineering

330:501 Systems Analysis

Problem Set 1

1. **S & B:** Ch.[1], prob. 1
2. **S & B:** Ch.[1], prob. 2
3. **S & B:** Ch.[1], prob. 4
4. **S & B:** Ch.[1], prob. 6
5. **S & B:** Ch.[1], prob. 7
6. **S & B:** Ch.[1], prob. 8
7. Let $x \in [0,1]$ and define the mapping $A(x) = bx(1-x)$ for $b \in (0,4]$.
   (a) What is the range of $A(x)$ in terms of b?
   (b) Show that $A(x)$ is a contraction mapping when $b < 1$. Identify the fixed point.
   (c) Show that $A(x)$ is *not* a contraction mapping when $b = 2$. However, prove that the sequence $x_{n+1} = A(x_n)$ converges to a fixed value and identify that value.
   (d) For $b = 3.9$, use a hand calculator (or computer) to find the first 20 values of the sequence $x_n = A(x_{n-1})$ starting from $x_0 = 0.1$ and $x_0 = 0.1000001$. Comment upon your findings.