Math 303 Assignment 9: Due Friday, April 6 at start of class

I. Problems to be handed in:

1. A factory consists of N identical machines, each operated by an employee. When a machine breaks down, its operator immediately begins to repair it. Each machine breaks down at rate μ, and each repair independently takes an exponential time of rate λ. Let $X(t)$ denote the number of machines that are working at time t. This defines a birth and death process.
   (a) Determine the birth and death rates.
   (b) Determine the limiting probabilities. (It is a certain binomial distribution.)
   (c) Suppose that $N = 50$, $\lambda = 10$, $\mu = 1$. What is the average number of machines that are operating, in the long run?
2. Chapter 6, Exercise 29.
3. Chapter 6, Exercise 32.
4. Chapter 6, Exercise 35.
5. Chapter 6, Exercise 40.

II. Recommended problems: These provide additional practice but are not to be handed in. Chapter 6: Exercises 16, 24, 28, 39, 43.