

# IEOR 6711: Stochastic Models I

Fall 2012, Professor Whitt

## Homework Assignment 3: Tuesday, September 18

### The Poisson Process

**Due in class on Tuesday, September 25.**

Problems from Chapter 2 of *Stochastic Processes*, second edition, by Sheldon Ross. In all homework and exams, show your work.

Problem 2.1 (in Ross) (Hint:  $e^t = \sum_{j=0}^{\infty} \frac{t^j}{j!}$  and  $e^t = \sum_{j=0}^k \frac{t^j}{j!} + o(t^k)$  by Taylor's theorem.)

Problem 2.3

Problem 2.4

Problem 2.5

Problem 2.6 (Hint: The times between successive part failures while the machine is working are IID exponential random variables with mean  $1/(\mu_1 + \mu_2)$ . The identities of the successive parts that fail are IID Bernoulli random variables with the probability part 1 fails being  $p_1 = \mu_1/(\mu_1 + \mu_2)$ , which are independent of the failure times.)

Problem 2.7

Problem 2.8

Problem 2.9

Problem 2.10

Problem 2.11

Problem 2.13 (Hint: For an easy proof, apply Proposition 2.3.2 in the special case  $P(s) = p$  for all  $s$ .)