

# MSG800/MVE170 Basic Stochastic Processes Fall 2013

## Exercise Session 4

### Sections 6.5, 6.8-6.9 and 6.11 in G-S's book

**Problems for own work.** As many as possible of Exercises 6.5.1, 6.5.2, 6.5.6 (a)-(b), 6.8.1, 6.8.2, 6.8.5, 6.8.6, 6.9.1, 6.9.2, 6.9.3, 6.9.9, 6.9.10, 6.11.1, 6.11.2 and 6.11.4 in G-S's book.

**Computer problem.** A birth and death process is the continuous time Markov chain described in the first few paragraphs of Section 6.11 in G-S's book. In particular, it has a stationary distribution given by Equation 6.11.2 in G-S's book. Find an approximative numerical value for the probability  $\mathbf{P}\{\max_{0 \leq t \leq 10} X(t) \geq 10\}$  for a birth and death process  $\{X(t)\}_{t \geq 0}$  with birth intensities  $\lambda_0 = \lambda_1 = \lambda_2 = \dots = 1$  and death intensities  $\mu_1 = \mu_2 = \mu_3 = \dots = 2$  that is in steady-state (that is, which is started according to its stationary distribution).

The correct value for the probability (according to Patrik's simulations) is approximately  $0.00826 \pm 0.00003$ .