Department of Mathematics and Statistics
Stokastiset prosessit
Exercises 4
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1. Consider a Markov chain with a state space $S = \{1, 2, 3, 4, 5, 6, 7\}$ and transition probability matrix

$$P = \begin{pmatrix} & 1 & & & & & \\ \frac{1}{3} & & & & & & \frac{2}{3} \\ & & & & 1 & & \\ & & \frac{3}{4} & & \frac{1}{4} & & \\ \frac{1}{5} & & \frac{3}{5} & & \frac{1}{5} & & \\ & & & \frac{1}{2} & & \frac{1}{2} & \\ \frac{2}{3} & & & & & & \frac{1}{3} \end{pmatrix}$$

a) Determine non-trivial absorption sets.

b) For each absorption set A determine the stationary distribution concentrated on A.

2. Continuation to the first exercise in Exercises 1. Show that MC in that exercise is reversible and determine its stationary distribution.

3. Continuation to the 5th exercise in Exercises 1. Suppose we consider the rain model described in the 5th exercise in Exercises 1.

a) Determine the stationary distribution of the model.

b) How many rainy days there are approximately on the interval $[0, n]$ provided that n is large ?

4. Exercises 3 exercise 5. (which we moved to this place)

5. (corrected modelling exercise): We fill a warehouse every day by one unit (used to be two units. . .) Evere day we sell the merchandises directly from the warehouse

according to the total demand Z_n unless there is not enough merchandises to sell. In that case just sell everything we can. Let us suppose that random variables $Z_n \sim \text{Geom}(a)$ modelling the demand are independent.

a) Model the MC X_n ="the number of units in the warehouse in the evening of the day n" by giving the state space S and the transition probabilities.

b) Is the MC (X_n) reversible ?

c) Determine the stationary distribution.