General Mathematics and Computational Science I

Exercise 19

November 22, 2005

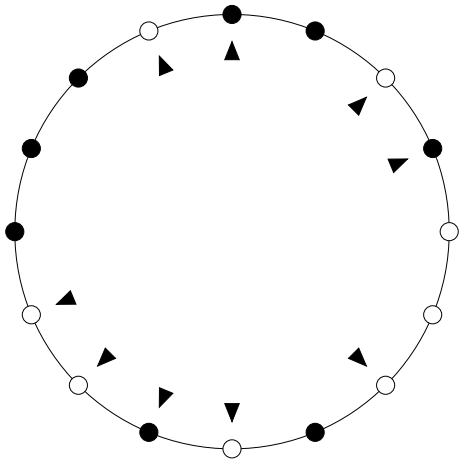
1. Solve the following linear programming problem using the simplex method.

   Maximize $z = 8\,x_3 - 3\,x_4 + 10\,x_5$ subject to

   $$\begin{aligned} x_1 - 2\,x_3 + x_4 - x_5 &= -1\,, \\ x_2 - 3\,x_3 + x_4 - x_5 &= -2\,, \\ x_i \geq 0 \text{ for } i &= 1, \ldots, 5\,. \end{aligned}$$

   Note: Use artificial variables to find an initial set of feasible basic variables.

2. In the Kac ring model, N sites are placed around a circle. The sites are populated with B black balls and $W = N - B$ white balls at random. Moreover, n markers are placed around the circle at random; the number of blace balls at a marked site is denoted b, the number of white balls at a marked site is w.

   Let μ denote the probability that a site has a marker on it. Explain why

   $$\mu = \frac{n}{N} = \frac{b}{B} = \frac{w}{W}\,.$$