Universität Erlangen-Nürnberg
Naturwissenschaftliche Fakultät I
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Integer and Nonlinear Optimization
Exercise 14

Problem 1 (6 points)
Prove that the search directions $\overline{d}^1, \ldots, \overline{d}^n \in \mathbb{R}^n$ computed in each iteration of the method of Rosenbrock (Algorithm 12.5) are linearly independent and orthogonal for any set of $\lambda_1, \ldots, \lambda_n$ computed in Step 2a.
Furthermore, show that if $\lambda_j = 0$ then $\overline{d}^j = d^j$.

Problem 2 (18 points)
Implement each of the following algorithms in Matlab and submint the ***running*** programs to pfeiffer@am.uni-erlangen.de.

(a) Cyclic coordinate method

(b) Method of Hooke and Jeeves

(c) Steepest descent method

(d) Conjugate gradient method of Fletcher and Reeves.

Find the minimum of $f(x_1, x_2) = (x_1^3 - x_2)^2 + 2(x_2 - x_1)^4$ by each of the four procedures, starting with $\underline{x}_1 = (1, 0)^T$ and $\varepsilon = \frac{1}{4}$. Illustrate the procedures in a graph showing the level curves of the function.