Optimization assignment — LP solution problem parameter 3

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We are asked to mimise the dot product between the vector $\vec{c}$ and the vector $\vec{x}$, subject to the constraints $0 \leqslant x_i \leqslant 1$. Since the objective is $c^t x = \sum_i c_i x_i$ under the constraints $0 \leqslant x_i \leqslant 1$, we can consider each x_i independently as there are no terms in the objective or in the constraints that have cross-dependencies.

Note that if the ith component of the vector c_i is positive, then the minimum value of $x_i c_i$ is possible if $x_i = 0$(since to $0 \leqslant x_i \leqslant 1$). Similarly, if the ith component of the vector c_i is negative, then the minimum value of $x_i c_i$ is achieved when $x_i = 1$. If c_i is 0, then the value of x_i does not matter. Hence, the optimal value of the x vector is:

$$x_i = \begin{cases} 1 & \text{if } c_i < 0 \\ 0 & \text{if } c_i \geqslant 0 \end{cases}$$