Problems for seminar 2

1. \((05-04-04-4a)\)

Using the phase 1 method, find a feasible point of the set

\[
\begin{cases}
-x_1 + x_2 + x_3 \geq 6 \\
x_1 + x_2 - x_3 \geq 1 \\
-x_1 + x_2 + x_3 \leq 4 \\
x_1, x_2, x_3 \geq 0
\end{cases}
\]

(0.5)

2. 5.17

3. \((2006-01-12, 4c)\)

For what values of \(a \in \mathbb{R}\) is the function

\[ f(x) = x_1^2 + 4x_1x_2 + ax_2^2 - 2x_1x_3 + 8x_2x_3 + 11x_3^2 \]

convex on \(\mathbb{R}^3\)?

4. 6.5

5. 6.6

6. Is the set

\[
\{(x,y,z) \in \mathbb{R}^3 : 10^{x^2+y^2} \leq \ln z, z > 0\}
\]

convex?