Name:

Find a solution (or solutions) that satisfies the KKT conditions for the following optimization problem:

$$\begin{aligned} \underset{x}{\text{minimize}} \quad & f(x) = x_1^2 + 2x_1 + 4x_2 \\ \text{subject to} \quad & h(x) = x_1 + x_2 - 12 = 0 \\ & g(x) = x_1 + 2x_2 - 2 \leq 0 \end{aligned}$$

The KKT conditions are given by:

1. $\nabla_x \mathcal{L}(x^*, \lambda^*, \mu^*) = \nabla_x f(x) + \lambda^* \nabla_x h(x^*) + \mu^* \nabla_x g(x^*) = 0$
2. $\mu^* \geq 0$
3. $\mu^* g(x^*) = 0$
4. $g(x^*) \leq 0$
5. $h(x^*) = 0$