- 1. Show that for every timed automaton \mathcal{A} with possibly rational constants in guards, there exists a timed automaton \mathcal{B} with only integer constants in guards such that $\text{Untime}(\mathcal{L}(\mathcal{A})) = \text{Untime}(\mathcal{L}(\mathcal{B}))$.
- 2. The region equivalence \sim_M is correct for checking language emptiness of automata with maximum constant M. Can you give an equivalence with fewer classes than \sim_M which is correct for checking language emptiness of a more restricted class of automata which have maximum constant M and:
 - i) all guards in the automaton are of the form $x \ge c$,
 - ii) both type of guards exist but each guard consists of atmost one atomic constraint, i.e., it is built from the grammar where conjunctions are disallowed:

$$\phi := x \le c \mid x \ge c \mid \neg \phi \qquad c \in \mathbb{Z}, \text{ and } x \text{ is a clock}$$

Justify your answer for the above two cases.