

Exercise Sheet 2

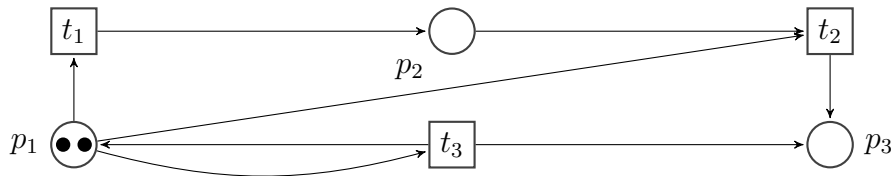
Problem 1: Some Proofs

Let $N = (S, T, W, M_0)$ be a Petri net.

- (a) Prove that $R(N)$ is finite if and only if N is bounded.
- (b) Prove that $\forall \sigma \in T^*$: if $M_1[\sigma]M_2$ then $(M_1 + M)[\sigma](M_2 + M)$ for any $M \geq 0$.
- (c) Prove that if $M_1[\sigma]M'_1$ and $M_2[\sigma]M'_2$ then $M'_1 - M_1 = M'_2 - M_2$.

Problem 2: Boundedness – Decision Procedure Example

Use the (**depth-first**) algorithm from class to decide if the following net is bounded.



Assume the natural ordering of transitions: t_1, t_2, t_3 .

Problem 3: Termination – Decision Procedure

Let $N = (S, T, W, M_0)$ be a Petri net.

- (a) Prove that N does not terminate **iff** there are $M_1, M_2 \in R(N)$ with $M_2 \geq M_1$ such that $M_0[\tau]M_1[\sigma]M_2$ for some $\tau \in T^*$ and $\sigma \in T^+$.
- (b) Devise an algorithm for deciding termination of Petri net N based on (a).

Problem 4: Termination – Decision Procedure Example

Use your (**depth-first**) algorithm from the previous exercise to decide termination for:

