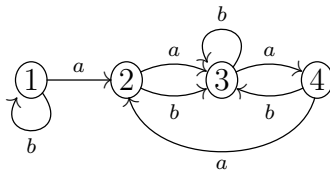# Algebra I – autumn 2024 – Homework 2

1. Determine all elements of the transition monoid of the automaton

2. Decide whether

$$\varphi \colon (\mathbb{Z}_4, +) \times (\mathbb{Z}_3, +) \to (\mathbb{Z}_6, +), \quad \varphi\big(([a]_4, [b]_3)\big) = [3a^2 + 2b]_6,$$

where $a, b \in \mathbb{Z}$, defines a map correctly. If so, decide whether it is surjective and whether it is a homomorphism of monoids.