*To be handed in no later than **April 17**. You may cooperate but you must write your solutions by yourselves. Please write full proofs!*

(1) A function $f : \mathbb{Z}_n \to \mathbb{Z}_k$ is *periodic* of period r, where $1 \leq r \leq n - 1$, if
$$f(m + r) = f(m), \quad \text{for all } m \in \mathbb{Z}_n.$$
Otherwise f is *non-periodic*. For $n, k \geq 1$, let $N(n, k)$ be the number of non-periodic functions $f : \mathbb{Z}_n \to \mathbb{Z}_k$ and prove
$$N(n, k) = \sum_{d | n} \mu(d, n) k^d,$$
where μ is the Möbius function of the division lattice D_n.

(2) Exercise 3.42,

(3) Exercise 3.57,

(4) Exercise 3.85,

(5) Exercise 3.90,

(6) Exercise 3.114a,

(7) Exercise 3.129.