duality of finite abelian groups

If A, B are two abelian groups, then the set

$$\mathrm{Hom}(A, B)$$

of homomorphisms from A to B is an abelian group.

pairing

There is a natural bilinear map

$$A \times \mathrm{Hom}(A, B) \to B$$

given by evaluation. More generally, one can consider a bilinear map

$$A \times B \to C$$

where A, B, C are abelian groups.

Definition

Such a pairing is called perfect if $A \xrightarrow{\sim} \mathrm{Hom}(B, C)$.

Let A be a finite abelian group. Then,

$$A \times \mathrm{Hom}(A, \mathbb{Q}/\mathbb{Z}) \to \mathbb{Q}/\mathbb{Z}$$

is a perfect pairing.

Sometimes, the group $\mathrm{Hom}(A, \mathbb{Q}/\mathbb{Z})$ is written as $A^\vee$, and called the Pontryagin dual of A.

Question

Let A be a cyclic group of order n. Is there an isomorphism $A \to \mathrm{Hom}(A, \mathbb{Q}/\mathbb{Z})$?