Problem Set 8

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1.1 Part a

Define a map

$$\begin{aligned} \phi_{\text{ev}} : \hom_R(\mathbb{Z}_m, A) &\to A \\ (f : \mathbb{Z}_m \to A) &\mapsto f(1) \end{aligned}$$

Then noting that ϕ_{ev} is a homomorphism, forcing $f(\overline{0}) = 0_A$ (where $\overline{0} : \mathbb{Z}_m \to A$ is the zero map), we must have

$$0 = f(0) = f(m) = mf(1),$$

we must have $mf(1) = 0$ in A. So im $\phi_{\text{ev}} = \{a \in A \mid ma = 0\}$.

It is also the case that

$$\ker \phi_{\text{ev}} = \{f \in \hom(\mathbb{Z}_m, A) \mid f(1) = 0\},$$

but if $f(