Exercise 1

(i) We want to show that $\ker(u) = 0$:
$\ker(u) \subset \ker(u^2) \subset \cdots \subset \ker(u^n) = \ker(u^{n+1}) = \cdots$ - Chain of submodules stablize
u is surjective $\to u^n$ is also, take;

$$x \in \ker(u), x = u^n(y) \to 0 = u(x) = u^{n+1}(y) \to u^n(y) = x = 0$$

so u is injective so an isomorphism.

(ii) NOT DONE.

Exercise 2