

**TAKE HOME EXTRA 36 points (added to the final) , MTH 320, SPRING 2009**

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- QUESTION 1.** (i) Find a subgroup  $H$  of  $(Q^*, \times)$  such that  $(Q^*/H, \wedge) \cong (Z_2, +_2)$  (note that an element in  $Q^*/H$  is of the form  $a \times H$  for some  $a \in Q^*$ ).
- (ii) Give me an example of an abelian group with 100 elements that is not cyclic.
- (iii) give me an example of a non-abelian group with 72 elements
- (iv) Is there a non-abelian group with 169 elements? If yes, then find it. If not, then explain why
- (v) Prove that every abelian group with 70 elements is cyclic.
- (vi) Construct a group homomorphism, say  $f$ , from  $(Z_{15}, +_{15})$  into  $(Z_{10}, +_{10})$  such that  $\text{Ker}(f) \neq Z_{15}$

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