Problem D (optional, for extra credit)

Last day to submit solutions: December 12, 2008

For which natural numbers n, m, and k, the function $f : \mathbb{Z}_n \to \mathbb{Z}_m$ given by $f([x]_n) = [kx]_m$

1. is well-defined?
2. preserves addition?
3. preserves multiplication?
4. is a group homomorphism?
5. is a ring homomorphism?