

Let  $u = 1 - x^2 - x^3$ ,  $v = 1 - x - x^4$ ,  $R = \mathbb{Z}[\zeta]$  where  $\zeta$  is a primitive 5th root of unity. By Dirichlet's Unit Theorem,  $U(R)$  has rank 1. To shorten the proof, we shall assume the number-theoretic fact that  $1 + \zeta$  is a fundamental unit in  $R$ . Consider the map  $\varphi: \mathbb{Z}G \rightarrow R$  defined by  $\varphi(x) = \zeta$ . Then  $uv = 1$  (by direct calculation), and  $\varphi(xu) = \zeta(1 - \zeta^2 - \zeta^3) = \zeta - \zeta^3 + (1 + \zeta + \zeta^2 + \zeta^3) = 1 + 2\zeta + \zeta^2 = (1 + \zeta)^2$ . Of course,  $1 + \zeta$  has infinite order. Then  $u$  has infinite order.