Q1) 1) $\rho^* = \bigcup_{n \geq 0} \rho^n = \bigcup_{n \geq 0} (a,b)$

ρ^* contains all binary relations of the form (a,b)

$(\rho^*)^{-1}$ contains all the reverse mappings of the form (b,a)

$((\rho)^1 \cup (\rho)^{-1})^*$ is the reflexive symmetric & transitive closure while $\rho^* \cup (\rho^*)^{-1}$ only has reflexive and symmetric elements

$\therefore \rho^* \cup (\rho^*)^{-1}$ will definitely be a subset of $(\rho \cup \rho^{-1})^*$

2) $(\rho \cup \rho^{-1})^* \neq \rho^* \cup (\rho^*)^{-1}$ as both contain reflexive and symmetric elements but $\rho^* \cup (\rho^*)^{-1}$ does not contain transitive elements. The transitive elements would be a part of only LHS.