H4Q1:

Proof: Suppose $a \in B \setminus C$, then $a \in B$ and $a \notin C$. Since $a \in B$, $a \in A \cup B$. Since $a \notin C$, $a \notin C \cap D$. Thus, $a \in B \setminus C$ implies $a \in (A \cup B) \setminus (C \cup D)$ □

H4Q2:

It is false.

Proof: To get a counterexample, we could let $n=7$, which is a prime number, so $n^2+n+7 = (7+1+1) \times 7 = 9 \times 7$, which is not a prime number. Thus, the arguement is false □

H4Q3:

Proof: To prove that if $x \neq 1$, then $y \neq 2$. We could assume that $y=2$. then the equation would be $4x = 2x + 2$. and $x=1$. So if $y=2$ then $x=1$, which is the contrapositive of "if $x \neq 1$, then $y \neq 2$". Thus, $xy^2 = 2x + y$ implies that if $x \neq 1$, then $y \neq 2$. □