Exercise sheet 2

Probability and Statistics, MTH102

1. Show that if the probability of $P(E|F) = P(E|F^c)$ then E is independent of F. In other words, if the probability of E remains unchanged whether F occurs or does not occur, then E must be independent of F.
2. Show that if $P(E|F^c) = 0$, then $P(F|E) = 1$. Can you give a real life interpetation of this?
3. Show that $P(A \cap B \cap C) = P(A)P(B|C)P(C|A \cap B)$
4. Show that $P(E_1 \cap E_2 \cap E_3 \cap E_4) = P(E_1)P(E_2|E_1)P(E_3|E_1 \cap E_2)P(E_4|E_1 \cap E_2 \cap E_3)$
5. If a deck of playing cards is divided into 4 piles of 13 cards each then what is the probability that each pile has at least one ace.