MATH 321: 9-1 GROUPWORK

(1) Consider the following two English sentences. Translate each into a formula of propositional logic, then construct truth tables for them.
   - If you don't eat your meat, you can't have any pudding.
   - A necessary and sufficient for me to not be cranky and to do well in math class is for me to get my coffee in the morning.

(2) Consider the following two formulae.
$$b \to (a \vee \neg a) \quad \text{and} \quad c \to (b \to (a \vee \neg a))$$
Construct truth tables for these formulae to verify that they are tautologies. Further consider the formula
$$d \to (c \to (b \to (a \vee \neg a))).$$
Can you explain why this is a tautology without filling out the 16 line truth table? What about
$$e \to (d \to (c \to (b \to (a \vee \neg a))))?$$
And you can keep going in the obvious manner. Can you give a general explanation for why they are all tautologies?

(3) Suppose you have two propositional formulae φ and ψ, using the same variables. Explain why φ and ψ are equivalent if and only if $(\varphi) \leftrightarrow (\psi)$ is a tautology.