Logic

1. a) It holds:

    - The statement (i) is equivalent to the statement (viii)
    - The statement (ii) is equivalent to the statement (vi)
    - The statement (iii) is equivalent to the statement (vii)
    - The statement (iv) is equivalent to the statement (v)

    b) According to statement (ix), either everyone in the math course drinks coffee, or there is only one student in the math course who does not drink coffee. Therefore, the equivalence to statements (i)-(viii) depends on the size of the math course. If the math course consists of exactly 2 students, i.e. $|M| = 2$, then (ix) $\Leftrightarrow$ (i) $\Leftrightarrow$ (viii) holds. However, if $|M| \geq 3$ holds, then (ix) is not equivalent to any of statements (i)-(viii).

2. a)

A	B	$\neg B$	$A \vee \neg B$	$\neg A \wedge \neg B$	$\neg(A \Rightarrow B)$	$A \wedge (A \Leftrightarrow B)$	$\neg A \Leftrightarrow \neg B$
true	true	false	true	false	false	true	true
true	false	true	true	false	true	false	false
false	true	false	false	false	false	false	false
false	false	true	true	true	false	false	true

   b)

A	B	$A \wedge \neg B$	$\neg A \wedge \neg B$	$(\neg A \wedge \neg B) \vee (A \wedge \neg B)$	$\neg B$
true	true	false	false	false	false
true	false	true	false	true	true
false	true	false	false	false	false
false	false	false	true	true	true

   According to the truth table it follows that $(\neg A \wedge \neg B) \vee (A \wedge \neg B)$ is equivalent to $\neg B$ and therefore can be simplified in that way.