PRACTICE 1:

1. Show the following arguments is tautology.
2. $(p∧ \left(p\rightarrow q\right))\rightarrow  q$
3. $(p\rightarrow q)\leftrightarrow (\~q\rightarrow \~ p) $
4. Negate the expression of $p\rightarrow q$
5. Show that the expression of $p∨\~(p∨q)$ and $p∨\~q$ is logical equivalent.
6. Prove that $p$ $∧(p∨q)$ $≡(p∨F)∧(p∨q)$.
7. What is the equivalence of $\left(\left(p∧\~p\right)∨\left(r∧q\right)\right)∨\left(\left(\~r∧\~p\right)∨\left(\~r∧q\right)\right)$?
8. Let $p$ stand for the proposition “I studied hard” and $q$ for “I got a scholarship”. Express the following as natural English sentences:
9. $¬p $
10. $p ∨ q $
11. $p ∧ q $
12. $p ⇒ q $
13. $¬p ⇒ ¬q $
14. $¬p ∨ (p ∧ q)$
15. $p$ = Anna comes to the class.

$q$ = Brian comes to the class.

$r$ = Charlie comes to the class.

$s$ = Dude comes to the class.

Formalize the following sentences:

* 1. If Dude comes to the class then Brian and Charlie come too.
	2. Dude comes to the class if and only if Charlie comes and Anna doesn’t come.
	3. If Dude comes to the party, then, if Charlie doesn’t come then Anna comes.
	4. Charlie comes to the party provided that Dude doesn’t come, but, if Dude comes, then Brian doesn’t come.