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Philos 12A
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Assignment #5

Exercise 5.2

It is not valid because we got P || Q and Q true, but to transform P || Q into a true sentence, we have to get P or Q true. So, P can also be true. Furthermore, we know that P infers P || Q, so it can be possible that P is true and not only false

For example:
P = Terry made a sandwich for lunch
Q = Terry made chili for dinner
¬P = Terry did not make a sandwich for lunch
P || Q = Terry made a sandwich for lunch, or Terry made chili for dinner
Therefore the conclusion of ¬P does not make this valid

Based on the rules, we would end up with the fact that P is, in fact, true. It would not make sense if P was false but since this is a possibility shown in the table below, this is not valid.

P || Q	**Q**	**¬P**	**P**
T	T	F	T
T	F	F	T
T	T	T	F
F	F	T	F

Exercise 5.4

This is valid based on the truth table created below. Given that The conclusion is ¬(P&&Q) and we are to infer ~Q, we know that the translation of that can also be P || ~Q. When we put this into a truth table, we see that these columns line up exactly the same therefore making this valid.

¬(P&&Q)	**P**	**Q**	**¬Q**	**P && Q**	**P || ~Q**
F	T	T	F	T	F
T	T	F	T	F	T
T	F	T	F	F	F
T	F	F	T	F	T

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Exercise 5.8

We cna use proof by cases here. a is on the left of b or is on the right of b. The second premise is a disjunction that says a is is the back of b or a is not on the left of b. To make this premise true, the first element before the disjunction depends on the second element evaluating to true, so a is to the right of b would be true. The third premise is a disjunction that says b is in front of a or a is not on the right of b. To make this premise true the first element must be true. Furthermore, c is in the same column as a and is in the same row as b. However, we do not need to know where c is as the conclusion does not state the position of c. Therefore we can say the final conclusion is a is in the back of b based on the evaluation of all the previous premises. The proof is now complete.

Exercise 5.14

Assuming we are looking at a joint truth table with P and S we can begin this informal proof. If S is a tautological consequence of P, for every True row value of P, S also mirrors this True value. Therefore S is a tautological consequence of P because every true value is reflected in both S and P. Similarily if we look at S is a tautological consequence of Q then we can use the same logic. If S has a true row value then Q will also mirror this value. Therefore S is a tautological consequence of Q because every true value is reflected in both S and Q. For S to be a tautological consequence of $P \vee Q$, all Truth values for S must also be true for $P \vee Q$. If we break down each case we find a few scenarios. If P is true then S is true based on the logic constructed in the beginning. Similarly if Q is true then S is also true based on the logic constructed in the beginning. Therefore if both P and Q are true then S is also true because S is a tautological consequence of P and also Q. Therefore we can conclude that everytime $P \vee Q$ is true, S will also be true in those rows. S is a tautological consequence of $P \vee Q$.

Exercise 5.23

In order to prove that n is odd when assuming at n^2 is odd, we use proof by contradiction. Suppose that n^2 is odd but n is even. If n is even then there exists an integer k such that $n = 2k$ by the definition of an even number. Therefore, $n^2 = (2k)^2 = 4k^2 = 2(2k^2)$, which leads to n^2 having an integer, m, where $m = 2k^2$ such that $n^2 = 2m$. From this we can conclude with the definition of an even number that n^2 is even. This contradicts the original statement that n^2 is odd. Through the proof by contradiction, we can conclude that if we assume n^2 is odd, n is also odd. ☐