

Quiz #3 Sample Solutions

- a. One way to solve this question is to compare the truth tables of each statement (alternatively, we could check the Venn Diagrams). Here are the truth tables for each statement:

A	B	C	(S0)	(S1)	(S2)	(S3)
T	T	T	T	T	T	T
T	T	F	F	F	F	F
T	F	T	T	T	T	T
T	F	F	T	F	T	T
F	T	T	T	T	T	T
F	T	F	F	F	F	F
F	F	T	T	T	T	T
F	F	F	F	T	F	F

The only columns that are identical to (S0) are (S2) and (S3), thus these two statements are equivalent to (S0). The truth value of (S1) differs from (S0) when A is true and both B and C are false, and when all of A , B and C are false.

- b. First we'll pick a statement equivalent to (S0) that has less implications to get rid of: we'll choose (S2). We use the fact the $P \Rightarrow Q$ is true exactly when either P is false or when Q is true (that is, $\neg P \vee Q$) to replace the implication. Thus, one solution is:

$$C \vee (A \wedge \neg B)$$

Alternatively, we can choose (S3) and use the fact that the implication $A \Rightarrow B$ is false exactly when A is true and B is false, thus replacing the negated implication to get:

$$(A \wedge \neg B) \vee C$$

Other solutions exist.