

MATH 61A Problem Set 1

Allan Zhang

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Problem 1

Draw the truth table for $P \rightarrow R$, and $P \rightarrow Q$ and $Q \rightarrow R$. Explain in words, referring to the truth tables, why the former statement implies the latter.

Truth tables for $P \rightarrow R$, $P \rightarrow Q$, and $Q \rightarrow R$

P	R	$P \rightarrow R$	P	Q	$P \rightarrow Q$	Q	R	$Q \rightarrow R$
T	T	T	T	T	T	T	T	T
T	F	F	T	F	F	T	F	F
F	T	T	F	T	T	F	T	T
F	F	T	F	F	T	F	F	T

Truth table for $P \rightarrow Q$ and $Q \rightarrow R$

$P \rightarrow Q$	$Q \rightarrow R$	$P \rightarrow Q$ and $Q \rightarrow R$
T	T	T
T	F	F
F	T	F
F	F	F

From these truth tables, we can observe that $P \rightarrow R$ is false when P is true and R is false. There are two cases when P is true, and Q is either true or false, providing us with two cases, either $P \rightarrow Q$ is true or false. In the case where the statement is true, Q is true, and vice versa. Now, let us consider when R is false. When Q is false but R is true, $Q \rightarrow R$ is false. When Q and R are false, $Q \rightarrow R$ is true.

Using these observations, I will explain how the former statement implies the latter.