## Math 351: Homework 1 (Due September 14)

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From the **0.1** exercises on pages 9, work exercises 1,2,3,5,6,7.

## Problem 1

Prove the following equivalences:

a) 
$$\neg (P \lor Q) \equiv (\neg P \land \neg Q)$$

	P	Q	$\neg P$	$\neg Q$	$P \vee Q$	$\neg (P \lor Q)$	$  (\neg P \land \neg Q)  $
ĺ	T	T	F	F	T	$\mathbf{F}$	$\mathbf{F}$
	T	F	F	T	T	$\mathbf{F}$	$\mathbf{F}$
	F	T	T	F	T	${f F}$	${f F}$
	F	F	T	T	F	$\mathbf{T}$	${f T}$

b) 
$$\neg (P \land Q) \equiv (\neg P \lor \neg Q)$$

P	Q	$\neg P$	$\neg Q$	$P \wedge Q$	$\neg(P \land Q)$	$(\neg P \lor \neg Q)$
T	T	F	F	T	$\mathbf{F}$	$\mathbf{F}$
T	F	F	T	F	${f T}$	${f T}$
F	T	T	F	F	${f T}$	${f T}$
F	F	T	T	F	${f T}$	${f T}$

## Problem 2

Prove that  $P \implies Q \equiv (\neg P) \lor Q$ . Deduce that the negation of  $P \implies Q$  is  $P \land (\neg Q)$ .

	T	F	T	T
$\left. egin{array}{c} T' \\ F \end{array}  ight $	$\left. egin{array}{c} F' \\ T \end{array} \right $	$egin{array}{c} F' \ T \end{array}$	F'	$egin{array}{c} \mathbf{F} \ \mathbf{T} \end{array}$
$\stackrel{\scriptscriptstyle \Gamma}{F}$	$\stackrel{\scriptscriptstyle I}{F}$	T	F T T	f T