Problem 1. Compute the compound truth table for $\neg p \wedge q$.

p	q	$\neg p$	$\neg p \wedge q$
T	T	F	F
T	F	F	F
F	T	T	T
F	F	T	F

Problem 2. Compute the compound truth table to see if $\neg(p \to q)$ is the same as $\neg p \to \neg q$. (In other words, *does negation distribute?*)

p	q	$p \to q$	$\neg(p \to q)$	$\neg p$	$\neg q$	$\neg p \to \neg q$
T	T	T	F	F	F	T
T	F	F	T	F	T	T
F	T	T	F	T	F	F
F	F	T	F	T	T	T

Problem 3. Compute the compound truth table to see if $(p \wedge q) \to r$ *is the same as* $p \to (q \to r)$. (Note that here, the equal sign is built into the table!)

p	q	r	$p \wedge q$	$(p \wedge q) \to r$	$q \to r$	$p \to (q \to r)$	$(p \wedge q) \to r \equiv p \to (q \to r)$
T	T	T	T	T	T	T	T
T	T	F	T	F	F	F	T
T	F	T	F	T	T	T	T
T	F	F	F	T	T	T	T
F	T	T	F	T	T	T	T
F	T	F	F	T	F	T	T
F	F	T	F	T	T	T	T
F	F	F	F	T	T	T	T

Problem 4. Translate the following propositions to logical statements (start with assigning each atomic proposition to a variable).

(a) We are friends if you like Discrete Mathematics or ice cream.

p: We are friends

q: you like Discrete Mathematics

r: you like ice cream

$q \vee r \rightarrow p$

(b) Either we are friends or you like ice cream, but not both.

$(p \vee r) \wedge \neg (p \wedge r)$

Problem 5. Define F to be the set of all ice cream flavors known to mankind. For any flavor f in F, define $L(f)$ to be the proposition that I like flavor f.

Translate the following statements to logical notation:

1. I like every flavor of ice cream.

$\forall f \in F\ L(f)$

2. I don't like any flavor of ice cream.

$\forall f \in F\ \neg L(f)$

Define $L'(f)$ to be the proposition that you like flavor f.

Translate the following statements to logical notation:

1. If you like a flavor of ice cream, I like it too.

$\forall f \in F\ L'(f) \rightarrow L(f)$

2. There isn't a flavor that we both dislike. (Try writing this without ¬!)

$\forall f \in F \; L(f) \vee L'(f)$