# CS365
# Homework #1

Joshua Gleason

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8. (a) If you have the flu, then you miss the final examination.
   (b) You do not have the flu if and only if you pass the course.
   (c) If you miss the final examination, then you will not pass the course.
   (d) You have the flu, or you miss the examination, or you pass the course.
   (e) If you have the flu then you will not pass the course, or if you miss the final examination then you will not pass the course.
   (f) You have the flu and you miss the final examination, or you do not miss the final examination and you pass the course.

10. (a) $r \wedge \neg q$
    (b) $p \wedge q \wedge r$
    (c) $r \rightarrow p$
    (d) $p \wedge \neg q \wedge r$
    (e) $r \leftrightarrow (p \vee q)$

34.

| p | q | r | s | $((p \rightarrow q) \rightarrow r) \rightarrow s$ |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 1 |
| 0 | 0 | 0 | 1 | 1 |
| 0 | 0 | 1 | 0 | 0 |
| 0 | 0 | 1 | 1 | 1 |
| 0 | 1 | 0 | 0 | 1 |
| 0 | 1 | 0 | 1 | 1 |
| 0 | 1 | 1 | 0 | 0 |
| 0 | 1 | 1 | 1 | 1 |
| 1 | 0 | 0 | 0 | 0 |
| 1 | 0 | 0 | 1 | 1 |
| 1 | 0 | 1 | 0 | 0 |
| 1 | 0 | 1 | 1 | 1 |
| 1 | 1 | 0 | 0 | 1 |
| 1 | 1 | 0 | 1 | 1 |
| 1 | 1 | 1 | 0 | 0 |
| 1 | 1 | 1 | 1 | 1 |

48. (a) $r \wedge \neg p$
    (b) $(r \wedge p) \rightarrow q$
    (c) $\neg r \rightarrow \neg q$
    (d) $(\neg p \wedge r) \rightarrow q$

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14.

$$
\begin{array}{lcll}
(\neg p \wedge (p \rightarrow q)) \rightarrow \neg q & \equiv & \neg(\neg p \wedge (p \rightarrow q)) \vee \neg q & \text{(From Table 7)} \\
& \equiv & \neg(\neg p \wedge (\neg p \vee q)) \vee \neg q & \text{(From Table 7)} \\
& \equiv & (\neg(\neg p) \vee \neg(p \vee q)) \vee \neg q & \text{(De Morgan's law)} \\
& \equiv & (p \vee \neg(p \vee q)) \vee \neg q & \text{(Double negation law)} \\
& \equiv & (p \vee (\neg p \wedge \neg q)) \vee \neg q & \text{(De Morgan's law)}
\end{array}
$$

Proposition can not be reduced further, therefore this is **not** a *tautology*, it is a *contingency*.

16. The propositions are true only when p and q are both positive, or both negative.

| p | q | $p \leftrightarrow q$ | $(p \wedge q) \vee (\neg p \wedge q\neg)$ |
|---|---|---|---|
| 0 | 0 | 1 | 1 |
| 0 | 1 | 0 | 0 |
| 1 | 0 | 0 | 0 |
| 1 | 1 | 1 | 1 |

40. $p \wedge q \wedge \neg r$