

MAT1830 - Discrete Mathematics for Computer Science
Assignment #2

To be handed in at the beginning of your support class in week 4 (20–24 March)

Show your working and give full explanations for all questions.

- (1) Use truth tables to determine whether $\neg(p \vee \neg(p \rightarrow q))$ is a tautology, a contradiction, or neither
- (2) Use truth tables or laws of logic to determine whether $(a \wedge \neg b) \rightarrow (b \vee c)$ is logically equivalent to $\neg a \vee b \vee c$.
- (3) Write down the contrapositive of each of the following statements.
“If it’s a bird, then it has feathers.”
“If the input is invalid, then the function doesn’t return 0.”
- (4) Pei Ann has been dealt two cards from a standard 52 card deck. She holds one in her left hand and one in her right.
Let p be the proposition “The card in Pei Ann’s left hand is an ace”.
Let q be the proposition “The card in Pei Ann’s right hand is an ace”.
Let r be the proposition “The card in Pei Ann’s left hand is a club”.
Let s be the proposition “The card in Pei Ann’s right hand is a club”.
Write propositions (using just p, q, r, s and logical connectives) corresponding to the following statements.
 - Pei Ann has exactly one club.
 - If Pei Ann has the ace of clubs in her left hand, then she doesn’t have a club in her right hand.
 - Pei Ann has at least one ace that is not a club.(If you’re not familiar with a standard 52 card deck of playing cards, have a look at http://en.wikipedia.org/wiki/Standard_52-card_deck.)
- (5) Show that $(\neg p \vee \neg q) \rightarrow \neg q \equiv p \vee \neg q$ using laws of logic.