

HOMEWORK 1, DUE SEP 11, 2017

- (1) Decide which of the following are mathematical sentences.
 - (a) $x^2 = (-x)^2$.
 - (b) For all real numbers x , $x^2 = (-x)^2$.
 - (c) If $x^2 = 5$, then $x = 3$.
 - (d) For a real number x , if $x^2 = 5$, then $x = 3$.
- (2) Write truth tables for the following statements, given A, B, C , three mathematical statements.
 - (a) $A \wedge (B \vee C)$.
 - (b) $A \Rightarrow (B \vee C)$.
 - (c) $A \Rightarrow \neg A$.
- (3) Write the negations of the following in good English (no symbols).
 - (a) Both Christmas and Rosh Hashanah are in September.
 - (b) If Christmas is in September, then Rosh Hashanah is in October.
 - (c) If Christmas is in September, both Rosh Hashanah and Id-ul-Fitr are in October.
- (4) Write truth tables to show that the following are logically equivalent.
 - (a) $\neg(P \vee Q)$ is logically equivalent to $(\neg P) \wedge (\neg Q)$.
 - (b) $P \wedge (Q \vee R)$ is logically equivalent to $(P \wedge Q) \vee (P \wedge R)$.
 - (c) $P \Rightarrow Q$ is logically equivalent to $(\neg Q) \Rightarrow (\neg P)$. (The last one is called the *contrapositive* of the first and so this shows a conditional statement is logically equivalent to its contrapositive).
- (5) Assuming the facts about integers as we did in class, show that if $a, b \in \mathbb{Z}$ with ab odd, then both a and b are odd. (Hint: Easier to use the contrapositive).