FALL 2019: MATH 558 QUIZ 1 SOLUTIONS

Each problem is worth 5 points.

1. Let X, Y be subsets of a universal set U. Define X', the complement of X, and then write down (without proof) one of the two variations of DeMorgan's Laws.

Solution. The complement X' is the set of elements $u \in U$ such that u is not in X. DeMorgan's laws are:

- (i) $(X \cap Y)' = X' \cup Y'$.
- (ii) $(X \cup Y)' = X' \cap Y'.$

2. Let X be a set and \sim a relation on X. Define what it means for \sim to be an equivalence relation. Solution. The relation \sim is an equivalence relation if:

- (i) $x \sim x$, for all $x \in X$.
- (ii) For all $x, y \in X$, if $x \sim y$, then $y \sim x$.
- (iii) For all $x, y, z \in X$, if $x \sim y$ and $y \sim z$, then $x \sim z$.