Math 300.1 Quiz 1 Fall 2017

Name: solution

1. (50 points) Let S and T be sets. Prove that if $x \notin S \cap T$, then $x \notin S$ or $x \notin T$.

$S \cap T = \{x : x \in S \text{ AND } x \in T\}$, by definition.

If $x \notin S \cap T$, then NOT $(x \in S$ AND $x \in T)$ is true. Simplifying we get that

$x \notin S$ OR $x \notin T$

is true.

2. (50 points) Negate the expression and simplify: $\exists x, \forall y (P(x) \text{ OR } Q(y))$.

Not $(\exists x, \forall y$ $(P(x)$ OR $Q(y))$

$\Leftrightarrow$

$\forall x \exists y$ NOT $(P(x)$ OR $Q(y))$

$\Leftrightarrow$

$\forall x \exists y$ $(\text{NOT } P(x))$ AND $(\text{NOT } Q(y))$.