CS518

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1 Problem 1

1.1

(c) $\forall x\,(P(x) \cup Q(x)) =$ (a) $P(x) \cup Q(x)$

1.2

Assume $P(x, y) =$ person in X-group beats up person in Y-group

$\forall x\,\exists y\ P(x, y) =$ every person in X-group beats up somebody in Y-group
$\exists y\,\forall x\ P(x, y) =$ there is a person in Y-group that everybody in X-group beats up

$\exists y\,\forall x\ P(x, y)$ implies $\forall x\,\exists y\ P(x, y)$ but the expressions aren't equivalent.

1.3

Assume $P(x) =$ a number is bigger than 0
Assume $Q(x) =$ a number is less than 5

$\forall x\,(P(x) \rightarrow Q(x))$ will evaluate False for numbers larger than 4
$\forall x.\,P(x) \rightarrow \exists x.\ Q(x))$ will always be True

The two statements, then, are not equivalent.

1.4

requires x != y