In-Class Exercises Monday Week 3

MATH250: Discrete Mathematics

Exercise 1.
Problems 3.24 - 3.29 from the text.

Exercise 2.
Which of the following are valid? If a statement is invalid, find an interpretation that makes it false.

1. $\forall x[P(x) \vee Q(x)] \rightarrow [\forall x P(x) \vee \forall x Q(x)]$

2. $\forall x[P(x) \vee Q(x)] \rightarrow [\exists x P(x) \vee \forall x Q(x)]$

3. $\exists x[P(x) \wedge Q(x)] \rightarrow [\exists x P(x) \wedge \exists x Q(x)]$

4. $\exists x[P(x) \vee Q(x)] \rightarrow [\exists x P(x) \vee \exists x Q(x)]$

5. $[\exists x[P(x) \wedge \exists x Q(x)] \rightarrow \exists x[P(x) \vee Q(x)]$

Exercise 3.
Rewrite each of these statements so that the negations appear only within predicates (that is, so that no negation is outside a quantifier or an expression involving logical connectives).

1. $\neg \exists y \exists x P(x, y)$

2. $\neg \forall x \exists y P(x, y)$

3. $\neg \exists y (Q(y) \wedge \forall x \neg R(x, y))$

4. $\neg \exists y (\exists x R(x, y) \vee \forall x S(x, y))$

5. (Challenge/Optional) $\neg \exists y (\forall x \exists z T(x, y, z) \vee \exists x \forall z U(x, y, z))$