Assignment #3

1. Give an example of a statement $P(x,y)$ such that

$$\sim((\forall x,\exists y,P(x,y)) \Rightarrow (\exists y,\forall x,P(x,y)))$$

Use Natural Deduction to prove the following
(where $P(x),P(x,y),Q(x),R(x)$ are statements)

2. $\forall x,P(x)$ or $\sim P(x)$
3. $x = y$ and $y = z \Rightarrow x = z$
4. $(\sim\exists x,P(x)) \Rightarrow \forall x,\sim P(x)$
5. $\sim(\forall x,\exists y,P(x,y)) \Rightarrow \sim(\exists y\forall x(P(x,y)))$
6. $(\forall x,R(x) \Rightarrow (Q(x) \Rightarrow P(x))) \Rightarrow \big((\exists x,\ R(x) \text{ and } Q(x)\big) \Rightarrow \big(\exists x,R(x) \text{ and } P(x)\big)\big)$
7. $\big(\exists!x,P(x) \text{ or } Q(x)\big)$ and $(\forall x,\sim P(x)) \Rightarrow (\exists!x,Q(x))$