HW 3   **Prof. Caldwell**

Due: 5 September 2013   **COSC 3015**

Prove the following. You may use the methods taught by Cowles & Velleman (Givens and Goals) or use the sequent rules from the handout.

1. $\vdash (\exists x.(P(x) \lor R(x))) \Rightarrow ((\exists x.P(x)) \lor \exists x.R(x))$

2. $\vdash (\forall x.(P(x) \land R(x))) \Rightarrow ((\forall x.P(x)) \land \forall x.R(x))$

3. $\vdash \neg(\exists x.P(x)) \Rightarrow (\forall x.\neg P(x))$

4. $\vdash (S \Rightarrow \forall x.P(x)) \Rightarrow (\forall x.S \Rightarrow P(x))$