Examlet 1 **Foundations of Advanced Math** **2/2/18**

1. If $a \equiv_3 2$, then $a^2 \equiv_3 1$.

2. Consider each of the following statements. Tell whether each is true or false, and justify your conclusion.

   (a) $(\exists x \in \mathbb{R})(\exists y \in \mathbb{R}), x + y = 0.$

   (b) $(\forall x \in \mathbb{R})(\exists y \in \mathbb{R}), x + y = 0.$

   (c) $(\forall x \in \mathbb{R})(\forall y \in \mathbb{R}), x + y = 0.$

3. For any $n \in \mathbb{N}, 3 \mid n^3 - n$

4. Determine whether the statements $(P \wedge Q) \vee R$ and $(P \wedge R) \vee (Q \wedge R)$ are logically equivalent.

5. $\sqrt{6}$ is irrational.