

Name and student number:

- [4] 1. (a) Prove that for each $a \in \mathbb{Z}$, $a \not\equiv 0 \pmod{3}$ if and only if $a^2 \equiv 1 \pmod{3}$.
 Hint: For any $a \in \mathbb{Z}$, we must have $a \equiv 0 \pmod{3}$, $a \equiv 1 \pmod{3}$, or $a \equiv 2 \pmod{3}$.
 The first case will take care of one direction of the if and only if (by contrapositive)
 and the other two cases will take care of the other direction.

- [2] (b) Prove that for each $n \in \mathbb{N}$, $\sqrt{3n+2}$ is not a natural number.
 Hint: Use part (a).

- [4] 2. Let A and B be sets. Prove that if $S \subseteq A$, then $S \times B \subseteq A \times B$.