MATH 215, FALL 2018 (WHYTE) REVIEW PROBLEMS

(1) Show that $n = 3$ is the only natural number with $n^2 > 2^n$

(2) Show that if $f : A \to B$ and $g : B \to C$ are bijective functions then $g \circ f$ is bijective.

(3) If a and b are relatively prime then there is an $n \in \mathbb{N}$ such that $a^n \equiv 1 \mod b$

(4) If $a^2|b^2$ then $a|b$

(5) If $f : A \to B$ is an injective function then for any A_1 and A_2, subsets of A, $f(A_1 \cap A_2) = f(A_1) \cap f(A_2)$

(6) If $gcd(n_1, n_2) = 1$ then for any r_1 and r_2 there is an a with $a \equiv r_1 \mod n_1$ and $a \equiv r_2 \mod n_2$

(7) If n is prime then n does not divide $(n-1)!$

(8) For every $n \in \mathbb{N}$ the sum of the odd numbers less than $2n$ is equal to n^2

The converses of all of (2) through (6) are true, and the converse of (7) is true except for $n = 4$. Can you formulate these statements? Can you prove them?