CSE 215 Midterm I (80 points)
1st March: 2:30-3:50pm (80 minutes)
Closed Book (1 Sheet of notes allowed).

Name:
1. **Proof I (20 points)** Prove that if \( r \) is rational then \( r^2 \) is rational.
2. Proofs - II (30 points)

(a) For all integers $n$ greater than 2, prove that $(n^2 - 1)$ is not prime.

(b) Your above proof should fail for $n = 2$, since $(n^2 - 1) = 3$ is prime. CIRCLE clearly the first line/sentence in the ABOVE proof where your proof fails for $n = 2$, and give a brief explanation below.
3. Quantifiers (30 points)

Assume the following boolean functions: $B(x)$ (Is $x$ a bird?), $O(x)$ (Is $x$ an ostrich?), $T(x)$ (Is $x$ is at least 9 feel tall?), $I(x)$ (Do I have $x$, i.e., does $x$ belong to me?), $L(x, y)$ (Does $x$ belong to $y$).

(a) Based on these functions, convert the following statements into quantified statements:

i. No birds except ostriches are at least 9 feel tall.

ii. There are no birds that belong to anyone but me.

iii. I have no birds less than 9 feel tall.

(b) From the above statements as facts, can you conclude that all birds are ostriches? Justify briefly (no need for a formal proof/disproof).
Scratch Work