QUIZ 1

(Math 258)

1. Determine whether each of the following arguments is valid: (4 pts)

   (a) If n is a real number such that $n > 1$, then $n^2 > 1$.
   Suppose that $n^2 > 1$. Then, $n > 1$.

   (b) The number π is irrational if it is not the ration of two integers.
   Therefore, since π cannot be written as in the form $\frac{a}{b}$ where a and b are integers, π is irrational.

   (c) If n is a real number such that $n > 2$, then $n^2 > 4$.
   Suppose that $n^2 \leq 4$, then $n \leq 2$.

   (d) If n is a real number such that $n > 2$, then $n^2 > 4$.
   Suppose that $n \leq 2$, then $n^2 \leq 4$.

2. Prove that if $3n + 2$ is even, where n is an integer, then n is even. (4 pts)
   (Hint: Use proof by contradiction)

3. Prove or disprove that the product of a non-zero rational number and an irrational number is irrational. (4 pts)

4. Prove that if x and y are real numbers, then $\max(x, y) + \min(x, y) = x + y$. (3 pts)
(Hint: Use proof by cases)

5. Show that the following statements are equivalent: (i) x is rational (3 pts)
(ii) $\frac{x}{2}$ is rational
(iii) $3x - 1$ is rational.

6. ***Wason's Cards***: Suppose you are given four cards, where each card has a letter on one side and a number on the other. The four cards read: A, D, 4 and 7. You are also given the following statement: (2 pts)

" If a card has a vowel on one side, then that card has an even number on the other side "

Which cards you have to turn over in order to check whether the statement above is <u>false</u> ? Explain.