CSC281 Discrete Mathematics for CS Students
Homework 1
Due Date: Sep, 25th

1. Let P(x,y) be the statement "$x + y > 0$". Determine the truth value of the following statements if the universe of the discourse is $\mathbb{Z}$.

$\forall x \, \forall y \, P(x, y)$	
$\forall x \, \exists y \, P(x, y)$	
$\exists x \, \forall y \, P(x, y)$	
$\exists x \, \exists y \, P(x, y)$	

2. Prove that if 4 divides (x^2+y^2), then x and y are both even? (Hint: use proof by cases).

3. Consider the function $f(x) = \frac{x^2+1}{x^2+2}$. Is this function one-to-one? Is it onto? Justify your answer.

4. Consider the sequence {..., 102, 105, 108, ...} where a_{50}=102, a_{51}=105, a_{52}=108. Assume $n \geq 1$. Find:

- **a.** The value of a_{200}
- **b.** The lowest index (n) where the term value (a_n) is just > 1000.

5. Calculate the following summation. Show all your work.

$$\sum_{k=36}^{48} [(k-1)(3k-2)]$$

6. Evaluate the following summation. Show all your work.

$$\sum_{i=1}^{n} \sum_{j=1}^{m} n^i$$