**COMP 170 Discrete Mathematical Tools for CS**
**2010 Spring Semester – Written Assignment # 6**
**Distributed: March 25, 2010 – Due: April 8, 2010**

At the top of your solution, please write your (i) name, (ii) student ID #, (iii) email address and (iv) tutorial section.
Some Notes:

- Please write clearly and briefly. For all questions you should also provide a short explanation as to *how* you derived the solution. That is, if the solution is 20, you shouldn't just write down 20. You need to explain *why* it's 20.
- Please follow the guidelines on doing your own work and avoiding plagiarism given on the class home page. Don't forget to *acknowledge* individuals who assisted you, or sources where you found solutions.
- Some of these problems are taken (some modified) fromthe textbook.
- Please make a *copy* of your assignment before submitting it. If we can't find your paper in the submission pile, we will ask you to resubmit the copy.
- Your solutions should be submitted before 5PM of the due date, in the collection bin in front of Room 4213A (This is near the TA labs).

**Problem 1:** Prove the DeMorgan's law that states $\neg(p \wedge q) = \neg p \vee \neg q$.

**Problem 2:** Which of the following statements (in which $Z^+$ stands for the positive integers and $Z$ stands for all integers) is true and which is false? Don't forget to explain why.
a) $\forall z \in Z^+ \, (z^2 + 5z + 10 > 17)$
b) $\forall z \in Z \, (z^2 - z \geq 0)$
c) $\exists z \in Z^+ \, (z - z^2 > 0)$
d) $\exists z \in Z \, (z^2 - z = 6)$

**Problem 3:** Show that the statements $s \Rightarrow t$ and $\neg s \vee t$ are equivalent.

**Problem 4:** (Distributive "Laws")
(a) Is $w \wedge (u \oplus v)$ equivalent to $(w \wedge u) \oplus (w \wedge v)$?
(b) Is $w \vee (u \oplus v)$ equivalent to $(w \vee u) \oplus (w \vee v)$?

**Problem 5:** (a) Construct a contrapositive proof that for all real numbers $x$, if $x^2 - 2x \neq 3$ then $x \neq 3$.
(b) Construct a proof by contradiction that for all real numbers $x$, if $x^2 - 2x \neq 3$ then $x \neq 3$.