Problem Set #0 (Sets, Logic & Proofs)
Due: Thursday, September 6

Reading: Read Chapter 1 of the textbook.
This assignment will be checked but not graded. You need not put your name on it.
If you don’t understand the question or how to determine the answer just answer: I don’t know.

Problems:

1. Consider the following three sets of numbers: $A = \{3,5,9\}$, $B = \{4,5\}$, $C = \{\text{even integers}\}$.
   i. What is $A \cup B$?  
   vi. What is $A \times B$?  
   ii. What is $A - B$?  
   vii. T or F: Is $B \subseteq A$?  
   iii. What is $A \cap B$?  
   viii. T or F: Is 9 $\in$ A?  
   iv. What is $A \cup C$?  
   ix. T or F: Is $B \in A$?  
   v. What is $C \cap B$?  

2. Say whether the following statements are true or false or neither if you cannot tell whether the statement is true or false.
   i. 2$n$ + 1 is greater than 17.  
   ii. For every $n$, 2$n$ + 1 is greater than 17.  
   iii. If $n > 10$ then 2$n+1 > 17$.  

3. What is the negation of  
   i. $x + y = 5$  
   ii. if $a \geq 5$ then $a \geq 7$  
   iii. For any triangle, the sum of the interior angles is 180 degrees.  

4. Determine whether the following implication is true. If it is true, provide a proof. If it is not true, provide a counterexample.
   “if $x$ is an odd integer then $x + 7$ is an even integer.”  

5. Prove that the equations
   $$y = 5 - 3/2x$$
   $$3x + 2y = 4$$
   have no simultaneous solution. That is, there is no $x$ and $y$ which make both equations true at the same time.
   Give a proof by contradiction.