CS251 homework 1

name:_____

Due: 10/8/19

1. Define variables, and write the following sentences as logical statements.

   - If it's not cloudy, then it's not raining.

   - If we won the big game, then either we scored more points, or the other team didn't show up.

   - This is a sentence.

   - If you don't study for tests, then you won't pass the class.

   - A graph is planer if it contains neither a minor of $K_{3,3}$ nor K_5.

2. Draw truth tables for the following formulas.

$a \oplus b$

a	b	$a \oplus b$
$\vert = \vert = \vert\vert = \vert$		

$\neg(\neg a)$

a	$\neg(\neg a)$

$\neg b \to \neg a$

a	b	$\neg a \to \neg b$

$\neg a \wedge \neg b$

a	b	$\neg a \wedge \neg b$

$a \leftrightarrow (b \leftrightarrow c)$

a	b	c	$a \leftrightarrow (b \leftrightarrow c)$

$(a \vee c) \wedge (b \vee c)$

a	b	c	$(a \vee c) \wedge (b \vee c)$

3. Reduce the following to the shortest form.
   Determine if it's satisfiable, a tautology, or neither.

   - $(a \wedge \neg b) \vee \neg(\neg a \vee b)$:

   - $a \wedge b \equiv \neg(\neg a \wedge \neg b)$:

   - $a \wedge b \equiv \neg(\neg a \vee \neg b)$:

   - $a \wedge (b \vee c) \rightarrow a \wedge (b \wedge c)$:

4. Draw ASTs for the following boolean expressions
   - $A \wedge B \rightarrow B \wedge C$
   - $A \rightarrow B \wedge B \rightarrow C$
   - $\neg A \wedge B \vee C \rightarrow D$
   - $\neg\neg A \vee \neg\neg B$
   - $(A \rightarrow B) \vee (B \rightarrow A)$

5. Get the code for representing boolean expresions here: `https://github.com/slibby05/prop.git`. You'll notice that it doesn't work because the eval method isn't defined. You need to fix that.
6. In the file hw1.py make the expressions from problem 4.

   Turn in hw1.py and AST.py to D2L.