Problem 1  Warm Up

Consider the following Boolean expressions. For each expression write out the corresponding truth table.

(a) \( \overline{A + B} \)

(b) \( AB + \overline{AB}C \)

Problem 2  Boolean Algebra

Ben Bitdiddle and Alyssa P. Hacker are having an argument over the equivalence of two Boolean expression (they have nothing better to do). Alyssa P. Hacker claims that the following two expressions are equivalent:

\[ AB + BC = (A(B + C))B \]

Ben Bitdiddle on the other hand disagrees and claims that they are not. Who is right? If they are equivalent, prove it using Boolean algebra. If they are not, evaluate the truth table to show that they are not equivalent.
**Problem 3  CMOS Circuits**

For the following Boolean expressions draw the equivalent CMOS gate implementation. Clearly mark the input and output signals and do not assume you have the complements of any signals. Minimize the number of CMOS transistors used in your implementation.

(a) $\overline{ABC}$

(b) $A + B + C$

(c) $(\overline{A} + B)\overline{C}$

**Problem 4  Bonus Question (Optional)**

Draw your interpretation of a NYAN gate (http://www.youtube.com/watch?v=QH2-TGULwu4) . Clearly label the inputs and outputs, and include a truth table.