Math 2534  Homework 11 on sets and Boolean Algebra
Show all work.

Problem 1: Use set Algebra to prove the following and justify each step.
   a) \[(B - A) \cup (C - A) = (B \cup C) - A\]
   b) \[[A^c \cup (B - A)]^c \cap A = A\]

Problem 2: The symmetric difference \(A \oplus B = (A \cup B) - (A \cap B)\) and may also be expressed as \(A \oplus B = (A - B) \cup (B - A)\). Prove that \((A \cup B) - (A \cap B) = (A - B) \cup (B - A)\) using algebra of sets.

Problem 3: Given elements \(a, b\) in the Boolean algebra \(B\) with operations \(\Box\) and \(\odot\) where \(m\) is the identity for \(\Box\) and \(p\) is the identity for \(\odot\), Justify each step of the proof below. The inverse of any element \(a\) is \(a'\). (You may put answers on this sheet in blanks below)

**Theorem:** For \(a, b\) in \(B\), \((a \Box b)' \odot (b \Box b) = m\)

**Proof:**
\[
\begin{align*}
(a \Box b)' \odot (b \Box b) &= \\
(a \Box b)' \odot b &= \\
(a' \odot b') \odot b &= \\
a' \odot (b' \odot b) &= \\
a' \odot m &= \\
m &= 
\end{align*}
\]

Problem 4: Given elements \(a, b\) in the Boolean algebra \(B\) with operations \(\otimes\) and \(\odot\) where \(k\) is the identity for \(\otimes\) and \(h\) is the identity for \(\odot\). Let \(\overline{b}\) be the complement of \(b\). Justify each step of the proof below.

**Theorem:** For \(a, b\) in \(B\), \([b \otimes (\overline{b} \odot a)] \circ (b \odot a) = \overline{a}\)