Problem 2
(a) $S \rightarrow aSb \mid a \cdot b$
   $S$ generates $a \cdot b$
   $X \rightarrowaaaa \mid a \mid b \mid bb \mid bbb$

(b) Typical strings: $a^ib^jd^k$

   $S \rightarrow Sd \mid X$
   $X \rightarrow aXdd \mid aYdd$
   $Y \rightarrow bbYe \mid b$ 

(c) $S \rightarrow aSb \mid A \mid B$
   $A \rightarrow Aa \mid a$
   $B \rightarrow Bb \mid b$

(d) Consider the condition $y = x_2 \cdot x_{i'} = x_2^u x_1^r$ when $u \in \{a, b\}$

   Typical string $x_1 x_2 = x_2^u x_1^r$

   $S \rightarrow aSa \mid bSb \mid X$
   $X \rightarrow Xa \mid Xb \mid Y$
   $Y \rightarrow aXa \mid bYb \mid c$

(e) Ignored (incorrect condition on exponents)
Problem 3. The given context-free grammar is not ambiguous.

Viewing the symbols $+, -, *, /$ as binary operators,
the CFG $G$ generates expressions (restricted) in post-fix notation.

Notice that, since the operators are always the rightmost symbols (to the right of the operands), we can always associate an "operation" with its two "arguments".

To prove that $G$ is not ambiguous, we consider a string $x \in L(G)$ that has two different rightmost derivations.
At each step of its derivation, we are re-writing the rightmost non-terminal of the current derivation ("sentential form" string yielded at that step).

Note that since all of our production rules in $G$ generate at least one non-terminal ($+$, $-$, $*$, $/$), they cannot differ in the productions taken at any step since at that point the strings yielded by the derivation would be different.