Part 1 — Ambiguous Grammars

These grammars are ambiguous. Prove that they are ambiguous by giving an input with two parse trees. Fix the grammars according to the precedence rules below.

**Example 1)**

\[
E \rightarrow E + E \\
\quad | E * E \\
\quad | - E \\
\quad | i
\]

Let * and + have their usual precedences, and associate to the left. Unary minus binds most tightly.

**Problem 1)**

\[
E \rightarrow E \ a \ E \\
\quad | E \ b \ E \\
\quad | E \ x \ E \\
\quad | E \ y \ E \\
\quad | i
\]

Let \(a\) have highest precedence, associating to the left. Next is \(b\), associating to the left. Then we have \(y\) associating to the right. Let \(x\) have the lowest precedence, and associate to the right.

Part 2 — First and Follow Sets

Calculate the first and follow sets for these grammars.

**Example 2)**

\[
S \rightarrow a \ E \ b \\
\quad | x \\
E \rightarrow x \ y \\
\quad | \epsilon
\]

**Example 3)**

\[
S \rightarrow a \ E \ F \ b \\
\quad | x E \ F \\
E \rightarrow x \ y \\
\quad | \epsilon \\
F \rightarrow E \ z \ q \\
\quad | w \ S
\]

**Problem 2)**

\[
S \rightarrow a \ F \ E \ b \\
\quad | x F \ E \\
E \rightarrow x \ y \\
\quad | \epsilon \\
F \rightarrow E \ z \ q \\
\quad | w \ S
\]