Challenge Activity 8 – Context Free Grammars (CFGs)

1. Consider the following language:

$$L = \{0^m 1^n 0^{m+n} \mid m, n \geq 0\}$$

and the following CFG:

$$S \rightarrow A \mid B$$
$$A \rightarrow \varepsilon \mid 0A0 \mid B$$
$$B \rightarrow \varepsilon \mid 1B0$$

   (a) Is this CFG ambiguous? Justify your answer.

   (b) How could one prove that this CFG recognizes all the strings of L? Justify your answer.

   (c) How could one prove that this CFG is a possible grammar for L?

   (d) Is the following CFG equivalent to the above CFG? Justify your answer.

$$S \rightarrow A$$
$$A \rightarrow 0A0 \mid B$$
$$B \rightarrow \varepsilon \mid 1B0$$