Alex Jacob
Prof. Cao

HW#7
10/16/20

1) a) No because you can choose $x=\varepsilon$, $y=a$, $z=a^p b^p$. Then $xy^i z \notin A$ for all $k \leq 0$

b) No because you cannot guarantee the number of states in the DFA. Then the Pumping Lemma cannot be applied

c) Yes

d) No because you can choose $x=\varepsilon$, $y=a^p$, $z=b$. Then $xy^i z \notin A$ for all $k \leq 0$

e) Yes

f) No because the string is not in the language.

g) Yes

2) a) $S \to aSa \mid bAb$
$A \to aA \mid bA \mid \varepsilon$

b) $S \to AaAaAaA$
$A \to bA \mid aA \mid \varepsilon$

c) $S \to bSb \mid bSa \mid aSb \mid aSa \mid b$

d) $S \to aSb \mid \varepsilon$

e) $S \to aSb \mid cSd \mid \varepsilon$