CS 254: Computability and Complexity	**Anonymous submission**
Problem Set #03	*October 1, 2019*

7. F = $\{a^i b^j c^k\}$ | i,j,k $\geq$ 0 and if i = 1 then j = k

A. Proof by contradiction:

Assume F is a regular language with a pumping length p. Our string s = ab^pc^p. Because |s| $\geq$ p we know s can be pumped. To prove that s is regular there exists a way to write s = xy^{i}z s.t. it follows the 3 conditions of pumping lemma:

i. xy^{i}z *in* L for every $i \geq 0$

ii.|y| > 0

iii. |xy| $\leq$ p

we break our string s up into xyz as: x = a, y = b, z = c.

if we set i = 2 for xy^{i}z we break case i, as a^1 however the number of b's and c's do not equal one another as the string after pumping is abbc, this is a contradiction therefore F is not regular.

B. F acts like a regular language because there are situations where it can be pumped to fulfill all three of the pumping lemma requirements.

For example: let our string s now be aab^pc^p. We know split our string so that: x = aa, y = b, z = c.

Now when we try to pump by setting i = 2 we get aabbc. Since there are two a's we don't need to fulfil the requirement if i = 1, then j = k. Therefore we meet all the conditions as:

xy^{i}z *in* L for every $i \geq 0$

|y| > 0

|xy| $\leq$ p

C. Every language that meets the conditions of the pumping lemma is not guaranteed to be regular. Rather, languages that don't meet the conditions are guaranteed to be not regular.