5. Assume the L is a CFL. L { ww| w $\in \{0,1\}^*$ By the pumping lemma we should be able to chose and string s $\in$ L and split it into s = uvxyz and satisfy these three conditions:
i. for each i $\geq$ 0, uv^{i}xy^{i}z $\in$ L,
ii. |vy| > 0, and
iii. |vxy| $\leq$ p

To prove this I choose string 0^p10^p1 It is a member of L and the length is greater than p so we know we can pump.
u = $0^{2p/3}$, v = $0^{p/3}$, x = 1, y = $0^{p/3}$, z = $0^{2p/3}$ 1

If we chose i = 3 then we get 00010001 $\in$ L
Therefore this can be pumped as it follows all the conditions and acts as a CFL

However, if we try pumping $0^p1^p0^p1^p$ we notice that it cannot be pumped:

Case one:

If the substring occurs only in the first half of s, when we pump by setting i = 2 we move a 1 into the first position of the second half therefore it cannot be in the form ww since w must start with a 0. The same occurs if vxy occurs in the second half of s moving a 0 into the last position of the first half so it also cannot be in the form ww.

Case two: vxy straddles the midpoint.

If vxy is straddling the midpoint and we pump down where i = 0 then uxz has the form $0^p1^i0^j1^p$ where i and j both cannot equal p. Thus this string is not in the form ww.

Since there is no positioning of uvxyz to pump the string we know L is not a CFL.