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Q1.53 $\Sigma = \{0, 1, +, =\}$

ADD $= x = y + z$ where x, y, z are binary x is sum of $y + z$

Show ADD is not regular

Assume Regular

Pumping Lemma:

$s = xyz$ $|y| > 0$, $|xy| \leq p$, $i \geq 0$ $xy^i z \in$ ADD

For pumping length p

Let $s = 1^p = 1^{p-1}0+1$

let $y = 1^k$ for $0 < k \leq p$

However if $i = 2$

$$xy^2z = 1^{p+k} = 1^{p-1}0+1$$

Since $k > 0$, $1^{p-1}0+1 = 1^p$ but not 1^{p+k}

This does not fall within ADD

This is a contradiction therefore contradiction