1.To show that $\ncong_L$ is an equivalence relation I must prove it is
Reflexive: aRa for all a $\in$ X
Symmetric: aRb implies bRa for all a,b, $\in$X
Transitive: aRb and bRc imply aRc for all a,b,c $\in$X

$a \ncong_L a$
If az$\in$L iff az$\in$L is true because az cannot both be in the language and not

$a \ncong_L b$ and $b \ncong_L a$
If az$\in$L iff bz$\in$L then bz$\in$L iff az$\in$L, this is true because in the first case if there is no string z that can be concatenated to make a=b then there would still not be any sting z that can make b=a

$a \ncong_L b$ and $b \ncong_L c$ implies $a \ncong_L c$
If az1$\in$L iff bz1$\in$L and bz2$\in$L iff cz2$\in$L, because there is no string z1 that can make bz1$\notin$L, and no z2 bz2$\notin$L than there is no string z3 that can make az3 $\in$NL and cz3$\in$L, so $a \ncong_L c$

Example: is we have a Language L of 0,1 that only accepts strings that start with a 1.

If we have string a = 101 then $a \ncong_L a$ is reflexive

If we have string b = 1 then $a \ncong_L b$ implies $b \ncong_L a$ is true because there is no string z to make az and bz not start with 1.

If we have string c = 1111 $a \ncong_L b$ and $b \ncong_L c$ implies $a \ncong_L c$ because if there is no string z to make a and b not in language L, and no sting z to make b and c not in language L. Then there can't be any z to make a and c not in language L.

2.If there is a finite number of strings k, then there must be a limit to a length of a string I will call that H.

Let x and y be strings $\leq$H, and let L be any language of strings $\leq$H. We say that x and y are differentiable by L if some string z$\leq$H, exists whereby exactly one of the strings xz and yz is a member of L. Otherwise, for every string z$\leq$H, xz$\notin$L iff yz$\notin$L and we say that x and y are in differentiable by L.

HW1

Gavin Grob

October 29, 2014