

; GA!Gi ddcfh'i `"'8cVfY[c'DUghYfnU'%\$&#) ž'' %! (%* '? fU_Œk a cV]`Y'Ž (, '* \$, %\$+()) ž'B =D', %' ''), * \$- 'F 9; CB.'%, %\$, %' ' (kkk"[ga!giddcfh"bYh

DUfUVYb: UWh: 1bXYf Gh1W





 $X][\]M' Yj\]XYbW''' H \]g' XYj\]W' Wb Y]h \ Yf' Xc' U' [\ YbYfU' Wc''YWh]cb' [\ Uh \ Yf]b[\ 'XUhU'h \ Uh' UfY'h \ Y'df]a\ Ufm'UfY'ug'cZ\]bhYfYgh']b' Wj \]^*$ X]j cfWr`]h][Uh]cb`cf`mci `WUb`[c`h\fci [\`U'gYf]Yg`cZei Ygh]cbg`UbX`Ubgk Yfg`hc`WfYUhY`U'W ghca `Wc``YWf]cb`cZX][]hU``XUhU"

H\Y: UWh:]bXYf Gh]W_]g XYg][bYX hc fi b cb U K]bXck g cdYfUh]b['gmghYa 'UbX Wca Yg k]h\ U: F99 UbU mg]g cf fYj]Yk 'hcc` $9j~[XYbWYFYj~]Yk~Yf'''Mci~'WUb~g]hk~]hh~mci~f'UhhcfbYmhc'fYj~]Yk~hh,Y'XUhU'UbX'XYhYfa~]bY']Z'mci~'bYYX'hc'\]fY'U'Zl~```ZcfYbg]W$ $YI\; Ua\;]bYf'Zcf'mci\; f'WUgY'''GUj\; Y'mci\; fgY'Z\; h'Y'hja\; Y'UbX'a\; cbYmVm'Xc]b[\;'Ub']b]h]U''YI\; Ua\;]bUh]cb'k\;]h''\; h'Y':\; UWh':\;]bXYf'Gh]W_'''$

 $\label{eq:hamiltonian} $H(Y): UWh:]bXYf^Gh]W_[gXYg][bYX^k]h(U^h(Y)gUa,Y^fi,Yg]b^a]bX^UgU^ZcfYbg]Whcc^igYX^Vm^Uk,YbZcfWfa,Ybh^jb^h(Y)fi,YgUa,Y^fi,YgUa,Yfi,Ygua,Yf$ $YI\ Ua\]bUh]cbg`gc`fYgh`Uggi\ fYX`h\ Uh`mci\ f`XUhU`]g`WcffYWh`UbX`gci\ bX"$

 $H\Y \ghJbXUfX \j Yfg]cb \]g'h\Y \: UWh': \]bXYf'Gh]\underline{W} \ \UbX'XcYg'bch']bWi \ XY'h\Y \bYYXYX'YI \ hYfbU'' \ghcfU[\ Y'\ Zcf'h\ Y'\ XUhU' \c'' YVWYX'Y \c''' YWhYX' YWhYY YWhYX' YWhYYY YWhYX' YWhYYY YWhYY YWhYYY YWhYY YWhY YWhY YWhY YWhYY YWhY YWY$

D'YUGY BchY. Mti 'a i gh'\Uj Y'U'fYa cj UV'Y'Xf]j Y'Zcf'ghcf]b['Wt``YWhYX'Yj]XYbWY'''7ca d'YhY'ZcfYbg]WYl Ua]bUh]cbg'cZ'Wta di hYfg $\label{lem:www.bully.cond} \begin{tabular}{ll} Wbb'' & Wbb'' & Wb'' & Wb''' & Wb'' & Wb''' & Wb'' & Wb'''$

YUhi fYg.

- FYWtj Yfg:8Y`YhYX`8UhU'! FYWtj Yfg:Z]`Yg:XY`YhYX`Zfca 'U'Wta di hYf'gi W. 'Ug'XcW'a Ybhgž'd]Whi fYgž'A D' gž'UbX`a cfY
 9I Ua]bYg:]D\cbY`6UW_i d'8UhU'!]D\cbY`VUW_i dg'WtbhU]b'a cgh'i gYf'XUhU'ghcfYX`cb'U'd\cbY`UbX`WUb'\c`X`U'hfYUgi fY hfcj Y cZ]bZcfa Uh]cb
- =bhYfbYh'<]ghcfm! 'J]Yk ']bhYfbYh'\]ghcfm'UbX 'WUWXY'Z]'Yg
- ?Ymk cfX GYUfWXYg'! GYUfWX Zcf'bUa Yg'cf'ch\Yf'_Ymk cfXg'hc'[Uh\Yf'XcW'a Ybhg'UbX'Z]Yg'WcbhU]b]b['gdYW]Z]Wk cfXg'cf d\fUgYg
- FYj]Yk '@]_Y'U'DfcZYgg]cbU''! 'CbW'XUhU']g'[Uh\YfYXž'mci 'WUb'fYj]Yk ']h'UbX'WfYUhY'fYdcfhg'i g]b['h\Y'gUa Y'9j]XYbW' FYj]Yk Yf d`UhZcfa 'Ug'Wta di hYf 'ZcfYbg]WYl Ua]bYfg

< ck ']h'K cf_g

- D`i ['mci f': UWh':]bXYf'Gh]W_']bhc'mci f'D7
- D`i [']b`mci f`ck b`fYa cj UV`Y`\UfX`Xf]j Y`k \YfY`Yj]XYbWf`k]```VY`ghcfYX
- FibhNY: UWh:]bXYfGh]W_@UibW\Yf"YIY'gcZhk UfY'Zfca 'h\Y': UWh:]bXYf'Gh]W_'IG6'Xf]jY

 7\ccgY'h\Y'UfYUg'cZ'mcif']bj Ygh][Uh]cb'UbX'W&``YWhXUhU

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