

; GA!Gi ddcfh'i `"8cVfY[c DUghYfnU'%\$&#) ž' %! (%* ??fU_Œk a cV]`Y`Ž (, '*\$, %\$+()) ž'B=D', %' ''), *\$- 'F9; CB.'%, %\$, %' ' (k k k "[ga!gi ddcfh'bYh

9`Wca gcZh']CG': cfYbg]WHcc`]h

 $9b\t^{2}\t$

DYfZcfa 'h\Y'Wta d'YhY'ZcfYbg]WUWei]g]h]cb'cZi gYf'XUhU'ghcfYX']b']D\cbY#]DUX#]DcX'XYj]Wfg"'9'Wta gcZh']CG': cfYbg]WHcc`_]h U`ck g'Y`][]V`Y'Wi ghca Yfg'UWei]f]b['V]h hc!V]h`]a U[Yg'cZ'XYj]WfgDZ]Y'gmghYa gž'YI hfUWh]b['XYj]W'gYWfYhg'fbUggWtXYgž'dUggk cfXgž UbX'YbWfmdh]cb'_YmgL'UbX'XYWfmdh]b['h\Y'Z]Y'gmghYa ']a U[Y"'5WWfgg hc'a cgh']bZcfa Uh]cb']g'dfcj]XYX']bghUbh'm'

D`YUgY`bchY`h\ Uh`bch'U```cZ'h\ Y`XYj]Wfg'UbX`]CG'j Yfg]cbg'UfY'gi ddcfhYXž'UbX`gca Y`a cXY`g'fYei]fY'^U]`VfYU_]b["'GYY'\fica dUh\V`Y\\
8Yj \Wfg'UbX`D`Uh\zcfa q 'Zcf'XYhU]`g"

: YUhi fYgʻUbXʻ6YbYZ]hg

- 5b'U``!]b!cbYž'Wta d`YhY'gc`i h]cb
- 5Wei]fY`Wca d`YhYž`V]h!dfYW]gY`XYj]WY`]a U[Yg
- $\bullet \ \ 8\,Y\,Wfmdh_Y\,mW\,U]b\,]hYa\,gz\,YI\,\,hf\,U\,Wfz\,XYj\,\,]Wf\,_Y\,mg$
- Ei]\(\widetilde{W}^Z\)]\(\cappa^g\) mghYa \(\widetilde{W}^i\)]g]h]cb. \(\&\\$!(\\$^a]\) bi hYg^Zcf^\(\dispa^c\); 6°a cXY\(\dispa^g\)
- NYfc! Zcchdf]bhcdYfUh]cb``YUj Ygbc'hfUWrg'UbX'bc'U'hYfUh]cbg'hc'XYj]WrgĐWcbhYbhg
- $\bullet : i ``m`UWWc'i bhUV`Y. `Yj Yfm`ghYd'cZ']bj Ygh][Uh]cb']g``c[[YX'UbX'fYWcfXYX] \\$
- Gi ddcfhg']CG'i d'hc'hc', "(
- <u>DUggWtXY`]g`bch`fYei]fYX</u>
- G]a d`Y`(!X][]h'dUggWtXYg`fYWtjYfYX`]b`%\$!(\$`a]bihYg
- A UWUbX K]bXck g j Yfg]cbg Uj U] UV Y
- 5i hca Uh]WUbX'a Ubi U`a cXYg'Uj U]`UV`Y

9`Wta GcZh'U`fYUXmcZZYfg'h\Y`UV]`]hm'hc`UWW'gg']bZcfa Uh]cb'ghcfYX`]b`]D\cbY#]DUX#]DcX`XYj]W'g`Vm'XYW'fmdh]b[`XUHU`VUW_i dg a UXY`k]h\`5dd`Y`]Hi bYg"`H\Y`bYk `hcc`_]hcZZYfg`UWW'gg`hc`a i W\`a cfY`]bZcfa Uh]cb`Wta dUfYX`hc`k \UhBg`Uj Uj`UV`Y`]b`h\cgY VUW_i dgž']bWi X]b[`UWW'gg`hc`dUggk cfXg`UbX`i gYfbUa Ygž'Ya U]``a YggU[Ygž'Udd`]\WJh]cb! gdYV]Z]WXUhU`UbX`a cfY"

<i [Y 'Ua ci bhg'cZ'\][\`mgYbg]h]j Y ']bZcfa Uh]cbZ'ghcfYX']b'i gYfgĐga Ufhd\cbYg'Wub'VY'UWWYggYX"'<]ghcf]Wu'`[Yc`cWuh]cb'XUhUž
j]Yk YX'; cc[`Y'a Udg'UbX'fci hYgž'K YV'Vfck g]b['\]ghcfm'UbX'Wu'```c[gž'd]Wvi fYgž'Ya U]''UbX'GA G'a YggU[Ygž'i gYfbUa Ygž
dUggk cfXgž'UbX'bYUf`m'Yj Yfnth\]b['hmdYX'cb'h\Y']D\cbY']g'VY]b['WwW\YX'Vm'h\Y'XYj]WY'UbX'Wub'VY'UWWYggYX'k]h\'h\Y'bYk
hcc`_]h"</pre>

FYU'! H]a Y'5WW gg'hc'9bW mdhYX'=bZcfa Uh]cb

?YmW\U]b FYWcj Yfmi

DUggWcXY FYWcj Yfm

?bck]b['h\Y`cf][]bU`dUggWtXY`]g'bYj Yf'fYei]fYXžVi h'a UmWta Y`\UbXm]b`h\Y`WUgY`cZ`]CG`(!+`XYj]WYgfZcf`]CG`, ž`\ck Yj Yfž']h']g`fYei]fYXt"`H\Y`Zc``ck]b['W\Ufh`\Y`dg'hc'i bXYfghUbX`k\Yh\Yf`mci Đ`bYYX`U`dUggWtXY`Zcf`U`gi WWyggZi``UWti]g]h]cb"

 $\label{eq:continuity} \begin{picture}(20,0) \put(0,0){\line(1,0){19}} \put(0,0)$

• 9a U]``a YggU[Yg/



• 7YfhU]b h\]fX!dUfhm'Udd`]WUh]cb XUhUž']Zh\Y'Udd`]WUh]cb fYei YghYX ghfcb[YbWfmdh]cb"

 $\begin{tabular}{ll} $ \CG^*, "I : "a cgh^*] b \cE^* a Uh^*] c \cE^* y \cE^*$

9`Wca gcZh`]CG`: cfYbg]WHcc`_]h`Wub`Vfi hY!ZcfWY`]CG`(Ž`g]a d`Y`(!X][]h`dUggWcXYg`]b`%\$!(\$`a]bi hYg"`7ca d`Yl `dUggWcXYg`Wub`VY $fYWej\ YfYX`Ug`k\ Y``ž`Vi\ h`fYei\]fY`a\ cfY`h]a\ Yž`Ug`ZUf`Ug`fYWej\ Yfm`]g`VY]b[\ `dYfZcfa\ YX`f][\ h`cb`h\Y`XYj\]WY`UbX`WUbbch`VY`XcbY$ "cZZ]bY" cb 'U 'ZJghYf 'Yei]da Ybh'

9gWfck :] Y Gi ddcfh

 $: cf']CG'(\texttt{\textit{\'z}'Ub'YgWfck'Z}]Y'WUb'VY'i gYX'hc'XYWfmdh'dfchYWhYX'd]YWfg'cZ]bZcfa Uh]cb'Yj Yb'k]h\ci h'_bck]b['h\Y'cf][]bU''dUggWcXY''$ 5b`YgWfck`Z]Y`WUb`VY`cVhU]bYX`Zfca`'U`Wta di hYf`k]h\`k\]W\`h\Y`XYj]Wf`i bXYf`]bj`Ygh][Uh]cb`\Ug`VYYb`WtbbYWfYX#gmbWfX"': cf]CG') `UbX'`UhYf'j Yfg]cbgžh\Y'g]a]`Uf'hYW\bc`c[m]g`VY]b['i gYX`Zcf`XYj]WY'gmbW]b['fk]h\`dU]f]b[`fYWtfXgtžVi h'h\YgY'fYVtfXg`WUb VY'i gYX'cb`m'hc'dYfZcfa i]Hi bYg`VUW_i d'cZ'h\Y`XYj]WY'fk]h\ci h'i b`cW_]b[']htz`Vi h'bch'Zcf'd\mg]WU`UWti]g]h]cb'cf'dUggWtXY **₩**UW<u></u>]b["

GmghYa FYei]fYa Ybhg

]CG:: cfYbg]WHcc`_]hiZcf`A UWCG`L fYei]fYg'Ub`=bhY`! VUgYX`A UWWta di hYf`fi bb]b[`A UWCG`L `%\$"* `fIGbck `@YcdUfXtZ`%\$"+ `fI@cbtZ %\$", `fA ci bhJ]b`@cbtž`%\$"- `fA Uj Yf]<u>W_g</u>t`cf`%\$"%\$`fMcgYa_]hYt`k_]h\`]Hi bYg`%\$"* `cf``UhYf`]bghJ``YX"

 $\label{localization} $$H\Y''Hcc'_]h'Zcf'A \]WfcgcZh'K \]bXck g'fYei \]fYg'h\Y'Wca di hYf'fi bb]b['K \]bXck g'L Dž'K \]bXck g'+ 'cf'K \]bXck g', \#, "%k]h\']Hi bYg'\%$"*$ cf``UhYf`]bghU``YX"

Ch\Yf`j Yfg]cbg`cZ`A UWCG`Lž`K]bXck g`UbX`]Hi bYg`a][\h'U`gc`k cf_`Vi h'\Uj Y`bch`VYYb`hYghYX"`

7ca dUh]V`Y`8Yj]WYg`UbX`D`UhZcfa g`

 $\label{eq:hamiltonian} $H(Y)^{-1}(G)$ dUggWcXY XcYg bch UWi U``ma UhhYf.

-]D\cbY'fbf][]bU'Ł
-]D\cbY"
-]D\cbY"; G
-]D\cbY'('fk GA'UbX'78A5'a cXY`gŁ
-]DUX ff//gh [YbYfUh]cbŁ
-]DcX 'Hci VX 'fl%gh'! '(h\ '[YbYfUh]cbgŁ

Gi ddcfh'Zcf'h\Y'Zc``ck]b['a cXY`g']g'`]a]hYX'hc''u]`Vfc_Yb'XYj]WYg'cb`mflgc'h\Y'XYj]WY'g\ci `X'VY'U'fYUXm'u]`Vfc_Yb'k]h\ $\label{eq:continuity} C\,dYbGG<`]bghU``YX\Brightarrow`YX\Brightar$ $j\ Yfg]cb\]g\ Wca\ dUh]V\ Y\ k\]h\ h\ Y\ 'U]\ VfYU_Ł.$

-]D\cbY'(g
-]D\cbY')
-]D\cbY') 7
-]DcX 'Hci WX 'fl) h\ '[YbŁ
-]DUX . &
-]DUX`k]h\`FYh]bU`X]gd`Um`fi' fX`UbX`(h\`[YbYfUh]cbgŁ
-]DUX A]b]

 $H\Y\Zc``ck\]b[\ff'(!V]hL'a\ cXY`g`UfY`bch'gi\ ddcfhYX`Uh'U``ž`fY[\ UfX`Ygg']CG'j\ Yfg]cb`UbX'`U]`VfYU_'ghUh'\ g.$

-]D\cbY') G
-]D\cbY.*
-]D\cbY * * D`i q
-]DUX 5]f
-]DUX A]b] k]h\ FYh]bU X]gd`Um

Gi ddcfhYX cdYfUh]b['gmghYa g.

-]CG'%!)
-]CG * "\$! * "%" & fk]h\ 'Yj Ug]\$b 'U]`VfYU_Ł
-]CG'*"%"'!*"%"* fk]h\ 'd\$g]I gdk b' '\U]`VfYU_Ł
-]CG + "\$ fk]h\ Yj Ug]\$b '\U]\VfYU_Ł
-]CG+"% fk]h\ DUb[i '%"&Z 'U]`VfYU_Ł]CG; "\$!, "%"& fk]h\ HU]; 'cf'DD'U]`VfYU_Ł
-]CG', "%"'!, "('fk]h\'HU]; '&"\$'^U]\VfYU_Ł









