

HfU[]gWXYg'l b[`ØW_.': ØbZ'HchY'VY] @Uk]bYbUV[Ub['Ua'F]adZ]gWX\cfb°

5a '&* "'A U]'&\$&) 'k i fXYb']b'XYb'K U``]gYf'5`dYb'ZØbZ'HchYbUW\'Y]bYa 'hfU[]gW\Yb'@Uk]bYbi bZU``']b'XYf'BÀ\Y'j cb NYfa Uhh'YbhXYW h"



F]a dZ]gW\\cfbž'K U``]gYf'5`dYbž'GW\kY]n'!'\\ XYb'K U``]gYf
5`dYb'_Ua 'Yg'Ua 'K cW\YbYbXY'ni 'Y]bYa 'hfU[]gW\Yb'I b[`\Ø\\Z'VY]
XYa 'Z\ØbZ'G_]hci fYb[Y\Yf'i a g'@YVYb'_Ua Yb"'8]Y'JYfi b[`\Ø_hYb\ki fXYb'i bhYf\U`V'XYg'F]a dZ]gW\\cfbg'Ui Z[YZ|bXYbž'bUW\XYa
Y]bY'; fi ddY'j cb'5`d]b]ghYb'Ui Z'Yhk U'("\$\$\$'A YhYfb'<\O\Y
a Y\fYfY'j Yf`UggYbY'G_]YfYbhXY_hY'i bX'5`Ufa 'gW\`i ["'8]Yg
VYf]W\khYh'cd!cb`]bY"XY"'

I bhYf`XYb`CdZYfb`VYZ]bXYb`g]W\`XfY]`GW\kY]nYf.`nkY]`A ÀbbYf`]a 5`hYf`j cb`', i bX`') \exists J\fYb`gck]Y`Y]bY`' (!^\A\f][Y`: fUi "'8]Y VY]XYb`UbXYfYb`]XYbh]Z]n]YfhYb`CdZYfb`g]bX`V]g`Ub[`i bVY_Ubbh'' 8]Y`h\OX`]W\Y`G]hi Uh]cb`YfY][bYhY`g]W\\\Z`U`g`X]Y`; fi ddY`Ua GUa ghU[`Zf\O\'j cb`XYf`6f]hUbb]U\\\\\OhhY`]a `; YV]Yh'j cb`GUUg!: YY

 $\label{thm:cwi} \begin{tabular}{ll} Ui ZV f UW \check{z}'i a `X Ug`F]a dZ]gW \cfb\check{z}'X Ug`W]fWU`("&$$`A Y hY f`\cW`]gh\check{z}'i a `X Ug`F]a dZ]gW \cfb\check{z}'X Ug`W]fWU`("&$$`A Y hY f`\@VY f`XYa `A YY fY ggd]Y [Y`gW bU``hY b`X]Y`5`d]b]ghY b`]\fY`G_]Y f`UV`i bX`gY hnhY b`]\fY`Hci f`ni: i \(``X Zcfh''' J Y fa i h`]W `k i fXY b`g]Y`j cb`Y]bYa `GW bYYV fY hh`Y fZUggh i bX`gh\@fnhY b`]b`X]Y`H]Y ZY'' \end{tabular}$

6Y] XYb 'Gi Wa U» bU\a Yb '_Ua 'Y]b'<i VgWkfUi VYf XYf '5]f 'NYfa Uhh ni a '9]bgUhn" '8]Y '9]bgUhn_fÀZhY 'YbhXYW_hYb 'ni bÀWkgh XfY] 'HchY Ui Z'Y]bYa '@Uk]bYb_Y[Y`" Nk Y] 'k Y]hYfY '`YV`cgY '5`d]b]ghYb 'k i fXYb gdÀhYf 'Ui Z'Y]bYf _`Y]bYb 'GWkbYYZÀWkY [YZi bXYbž bUWkXYa 'XUg ; YV]Yh cVYf\U`V 'XYg 'YfghYb': i bXcfhg 'UV[Ygi Wkh'k i fXY"

I bZU``gYf]Y]b XYb 6Yf[Yb

8 Ugʻl b[`ØW_'Ua 'F]a dZ]gW\\cfb'k Ufʻb]W\h'XYfʻY]bn][Y'hfU[]gW\Y J cfZU```Ub'X]YgYa 'K cW\YbYbXY"'5a 'gY`VYb'HU['[Yf]Yh'Y]bY K UbXYf[fi ddY']a 'K]`XYb'?U]gYf']b'6Yf[bchž'_cbbhY'^YXcW\'Xi fW\Y]bYb'Bchfi Z'YfZc`[fY]W\'[YfYhhYh'k YfXYb"'Ni XYa 'k i fXY'j cb'XYf 6Yf[k UW\h'VYf]W\hYhž'XUggʻg]YVYb'K UbXYfYf'Ua 'DfYX][ghi\``]a@UhhYb[YV]f[Y'[YfYhhYh'k i fXYb'U'd]b"XY"'JÒ``]['i bhYfgW\]YX`]W\Y GnYbUf]Ybž'YXcW\'a]h'Y]bYa '[Ya Y]bgUa Yb'BYbbYf.'8]Y'6Yf[Y ghY``Yb'ZØfj]YYY'A YbgW\Yb'Y]bY'[fc»Y'; YZU\f'XUf"

=a `Ni gUa a Yb\Ub['a]h`XYb`< YfUi gZcfXYfi b[Yb'j cb'G_]hci fYb\UhiYg'Ui W\]b`XYf'J Yf[Ub[Yb\Y]h`hfU[]gW\Y'J cfZ\ ``Y'[Y[YVYb"'Gcki fXY'Ua '%\$"'5i [i gh'&\$&(`X]Y'@Y]W\Y'Y]bYf'j Yfa]gghYb&, !'\A\f][Yb'G_]hci fYb[Y\Yf]b']b']b'XYf'B\A\Y'XYf'HÆhY'6`UbW\Y'[YZ bXYb"'8]YgY'\UhhY'Ua '- "'A\Afn'&\$&('Y]bYb'Bchfi Z'UV[YgYhh½'bUW\XYa ']\fy'; fi ddY'j cb'Y]bYa 'Ghi fa 'ØVYffUgW\h'k i fXY'': ØbZkY]hYfY'A]h[`]YXYf'XYf'; fi ddYž'X]Y'a]b]a U''Ui g[YghUhhYh'k UfYbžjYfghcfVYb'YVYbZU'`g']b'XYb'6Yf[Yb'VY]'YI hfYa YbKYhhYfVYX]b[i b[Ybž'U`g'g]Y'j Yfgi W\hYbž'Y]bY'GW\bYY\Ò\`Y'ni[fUVYbž'k Ug'Ui Z[fi bX'i bni fY]W\YbXYf'5i gfØghi b['gW\Y]hYfhY''8]Y'6Y\Ui dhi b['j cb'U`d]b"XY'gdf]W\h'j cb'HYa dYfUhi fYbž'X]Y'V]gUi Z'a]bi g'%, '; fUX'gUb_Yb'i bX'K]bX[YgW\k]bX][_Y]hYb'j cb'ØVYf%\$\$'_a #\"

 $8]YgYg^{*}@b[ghY^{*}Ib[^{*}@W_{^{*}}Ua^{*}F]a^{*}dZ]gW_{^{*}}cfb^{*}j^{*}YfXYih^{*}]W_{^{*}}h^{*}Y]ba^{*}U^{*}$

8 Y hU]`g	
JcfZU``	Hc X
I fgUWXY	GWXbYYVfYhh
Cfh	F]a dZ]gWX\cfbž'K U``]gYf'5`dYbž'GWXkY]n
EiY``Yb	k k k "cd!cb`]bY"XY
	• k k k "U`d]b"XY
	• k k k "U`d]b"XY

6Ygi WXYb G]Y i bg Ui Z. b!U["bYh