

$BUWX \setminus U^h][Yg^6UiYb^]b^?Uf^gfi \setminus Y.$ 9]bV^]W_Y^]b^]bbcj Uh]j Y^Dfc^Y_hY^Ua^? \text{+H}

GhUUhggY_fYhÀf]b 5bXfYU @]bX`c\f VYgi WkhY]bbcj Uh]j Y Dfc Y_hY ni a 'bUWk\U`h][Yb 6Ui Yb Ua '? ≠l]b ? Uf`gfi \Y i bX]bZcfa]YfhY g]Wk ØVYf n]f_i `ÀfY 6Ui UbgÀhnY"

8]Y'<YfUi gZcfXYfi b[Yb'XYg'6Ui Ybg'bUW\\U`h]['ni 'a Y]ghYfbž'g]bX
Y]b'nYbhfU`Yg'5b`]Y[Yb'XYf'a cXYfbYb'5fW\]hY_hi f"
GhUUhggY_fYhÀf]b'5bXfYU'@]bX`c\f'VYgi W\hY'Ua 'A cbhU[ž'XYb'&-"
\$\foralle{1}\]'\&\$&(\otiny a Y\fYfY']bbcj Uh]j Y'Dfc'Y_hY'Ua '? Uf`gfi \Yf'\Dgh]hi h'ZØf
HYW\bc`c[]Y'f?\Df'\8]YgYf'6Ygi W\'\YVh'b]W\h'bi f'X]Y'U_hi Y``Yb
9bhk]\W_`i b[Yb']a '6YfY]W\'XYg'bUW\\U`h][Yb'6Ui Ybg'\Yfj cfz'
gcbXYfb'j YfXYi h`]W\h'Ui W\'X]Y'Bchk YbX][_Y]hz'`c_U`Y'FYggci fWb'i bX'FYWmW]b[a UhYf]U`]Yb']b'XYf'6Ui]bXi ghf]Y'ni ']bhY[f]YfYb''

A $UhYf]UV]V]chVY_Ug'=bgd]fUh]cbgeiY``Y$

9]b YfghYf'< U`h'k Uf'X]Y 'A UhYf]U`V]V`]ch\Y_'XYg'? \dizX]Y 'Z\Of 5fW\]hY_hi fghi X]YfYbXY 'Y]bY 'YggYbn]Y``Y \diz Zcfa Uh]cbgei Y``Y XUfghY``h'' <]Yf``]Y[h'Y]b 'VYgcbXYfYf'GW\k Yfdi b_h'Ui Z'A UhYf]U`]Yb\ZX]Y 'Ybhk YXYf'`c_U`'dfcXi n]Yfh'cXYf'VYgW\U\ZZh'k YfXYb'_\ObbYb'' 8]YgY'A UhYf]U`]Yb'g]bX'b]W\h'bi f'bUW\\U`h][\diz gcbXYfb'_\ObbYb'' \div W\]a 'V]c`c[\]gW\Yb'?fY]g`Ui Z'_ca dcgh]Yfh'cXYf']a 'hYW\b]gW\Yb ?fY]g`Ui Z'k]YXYfj Yfk YbXYh'k YfXYb'''8Yf': c_i g'Ui Z GY_i bX\deltaffc\ghc\ZY'V]YhYh'[fc\narrow Y'7\Ub\W\b\Z'X]Y'A UhYf]U`j Yfgcf[i b[XYf'6Ui]bXi ghf]Y'i a k Y`hZfYi bX`]W\Yf'ni '[YghU`hYb''

8 Ug F c c Z? +H. '=bbcj Uh]cb']b'XYf K c\bfUi a [YghU`hi b[

9]b k Y]hYfYg <][\`][\h'k Uf X]Y J cfghY \sim i b[\sim XYg F cc Z? \rightarrow HžY]bYa

DfchchmdYbžXYf'VY]'XYa 'Gc`Uf'8YWUh\`cb'9i fcdY'&\$&&'U`g
g]Y[fY]WXYf'6Y]hfU['Ui g[YnY]WXbYh'k i fXY"'8]YgYf'9bhk i fZ'n]Y`h

XUfUi Z'UVž'gcn]U`'[YfYWXhYfYb'K c\bfUi a 'ni 'gWXUZZYbž'c\bY

XUVY]'YggYbh]Y``Y'bUhØf`]WXY'FYggci fWYb'ni 'VYUbgdfi WXYb"'8Yf

FccZ? \(\delta\) bi hnh'Y]bY'a cXi `UfY'6Ui k Y]gYž'X]Y'`Y]WXh'UV!'i bX'k]YXYf

a cbh]Yfh'k YfXYb'_Ubbž'i bX'_ca V]b]Yfh'XUVY]'bUhØf`]WXY

A UhYf]U`]Yb'k]Y'<c`nž'@Y\a 'i bX'D]`ncf[Ub]ga Yb'a]h

k]YXYfj Yfk YbXYhYb'GhcZZYbž'XUfi bhYf'U`hY': YbghYf'i bX'HY]`Y'j cb

@_k!D`UbY"'@]bX`c\f'VYhcbhY.' 8Ug'FccZ? \(\delta\)'j YfY]bh'j]Y`Y

]bbcj Uh]j Y'5bgÀhnY'i bhYf'Y]bYa '8UWXž'k cVY]'X]Y

K]YXYfj Yfk YbXVUf_Y]h'j cb'A UhYf]U`]Yb'\]Yf'_cbgYei Ybh

Xi fWXXUWXh'k]fX"

JYfgi WXgUbghU`h'ZØf'GhU\`ž'<c`n'i bX'GhY]bY. : cfgWXi b[gUbgÀhnY

8]Y``YhnhY`GhUh]cb`XYg`6Ygi Wkg`k Uf`X]Y`J Yfgi WkgUbghU`h`ZØf`GhU\`ž <c`n`i bX`GhY]bY`Ua``? #Iž`X]Y`: cfgWki b[`i bX`@Y\fY`a]h dfU_h]gWkYb`DfØZi b[Yb`i bX`NYfh]Z]n]Yfi b[Yb'j cb`6Ui dfcXi_hYb j YfY]bh"`@]bX`c\f`]bZcfa]YfhY`g]Wk`ØVYf`XUg`n]f_i `ÀfY`6Ui Yb`i bX X]Y`U_hi Y``Yb`: cfgWki b[Yb`ni f`K]YXYfj Yfk Yfhi b['j cb 6Ui _ca dcbYbhYb"`G]Y`Yf_`ÀfhY.` 8]Y`j cf\UbXYbYb`A UhYf]U`]Yb`]b VYghY\YbXYb`; YVÀi XYb`g]bX`Y]b`k U\fYf`: i bXi gž`XYb`k]f`bi hnYb a ØggYbž`UbghUhh`bi f`Ub`5Vf]gg`ni `XYb_Yb" `8]YgY`5bgÀhnY`g]bX YbhgWkY]XYbX`ZØf`X]Y`GWkUZZi b[`Y]bYg`bUWk\U`h][Yb 6Ui dfcnYggYg"

8]Y'6YXYi hi b['bUW\\U`h][Yb'6Ui Ybg'ZØf'X]Y; YgY``gW\UZh

8]Y = 1]h]Uh]j Yb i bX: cfgWki b[YbžX]Y X]Y GhUUhggY_fYhÀf]b
VYgi WkhYžg]bX b]Wkh bi f hYWkbc c[]gWk VYXYi hgUa "G]Y hfU[Yb
Ui Wk XUni VY]žXUg 6Yk i gghgY]b ZØf bUWk \U`h][Yg 6Ui Yb]b XYf
; YgY `gWk UZh ni gWk AfZYb "= XYa]bbcj Uh]j Y @Ogi b[Yb Ui Z[YnY][h
k YfXYbž _ ObbYb gck c \ `5fWk]hY_hYb U`g Ui Wk 6Ui \YffYb
]bgd]f]Yfh k YfXYbži a k Y`hVYk i gghYfY 9bhgWkY]Xi b[Yb ni hfYZZYb"
8 Yf 8 fi W_žbUhØf`]WkY F Yggci fWYb ni gWkcbYbži bX X]Y

Bchk YbX][_Y]hžFYggci fWfb`YZZ]n]Ybh'ni `bi hnYbž'g]bX`\Yi hYk]Wkh][Yf'XYbb`Y"'@]bX`c\f'VYhcbhYž'XUgg'Xi fWk'gc`WkY'DfcY_hYY]bY'6fØW_Y'nk]gWkYb']bbcj Uh]j Ya '6Ui Yb'i bX'XYa '9f\U`h i bgYfYf'I a k Y`h'[YgWk`U[Yb'k]fXž'k Ug'`Yhnh`]Wk'YXYf'DYfgcb ni [i hY_ca a h"

B 5;

8 Y hU] `c

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