

## FUXYVYf[Yf'6]YfghUXhZYgh'&\$&).'9]b': Ygh ZØf'X]Y'[UbnY': Ua]`]Y°

8 UgʻF UXYVYf[ Yfʻ6]YfghUXhZYghʻ&\$&) `Vchʻ: Ua ]`]YbʻnU\`fY]WXY 5\_h]j ]hÀhYbž'Y]bʻj ]Y`ZÀ`h][ YgʻDfc[ fUa a 'i bX'YfZfYi hYʻg]WX [ fc» Yfʻ6Ygi WXYffYgcbUbn"



FUXYVYf[ ž'8 Yi hgW `Ub X'!'8 Ug'F UXYVYf[ Yf'6]YfghUXhZYghž'XUg j ca '&"'V]g'("'\*j b]'&\$&' ']b'XYf'\*bbYbghUXh'ghUhhZUbXž'ØVYfnYi [ hY a ]h'Y]bYa 'UVk YWkg`i b[ gfY]WkYb'Dfc[ fUa a 'i bX'Y]bYf'Zf]YX`]WkYb 5ha cgd\ÀfY"'; Ya À» 'XYb'6Yf]WkhYb'j cb'GÀWkg]gWkY"XY'\UhhYb X]Y'J YfUbghU`hYfž'ni 'XYbYb'X]Y'GhUXh'F UXYVYf[ ž'XYf; Yk YfVYj YfY]b'i bX'X]Y'F UXYVYYf[ Yf'9| dcfhVfUi YfY]'[ Y\ÒfhYbž X]Y'G]hi Uh]cb'[i h']a '; f]ZZ'', VYf'') "\$\$\$'6Ygi WkYf'k i fXYb Yfk UfhYhž'i bX'XUg'9j Ybh'Vch'j ]Y`ZÀ`h][ Y'\_i `]bUf]gWkY? Ogh`]Wk\_Y]hYb'nk ]gWkYb'?U]gYf\cZi bX'A Uf\_h"

 $8 \ Yf'C \ VYfV \ \emptyset f[\ Yfa \ Y]ghYf': fUb\_'<\mathring{O}\ a \ Y'Yf \mathring{O}ZZb YhY'X Ug': Ygh'Ua \\ : fY]hU[\ UVYb X'a \ ]h'XYa 'hfUX]h]cbY``Yb'6]YfZUggUbgh]WX'''8]Y'; \grave{A}ghY \_cbbhYb'g]WX'Ui Z'5i Zhf]hhY'`c\_U`Yf'A i g]\_[ fi ddYb'gck ]Y'Y]b'VfY]hYg$ 

5b[YVch'Ub'5\_h]j]hÀhYb'ZØf': Ua]`]Yb'ZfYi Ybž'XUfi bhYf'Y]b DfcY\_hn]f\_i g'gck]Y'5b[YVchY'XYg'FUXYVYf[Yf'?fØaY``UbXgž'X]Y X]Y'?]bXYf'a]h'<ØdZVi f[Yb'i bX'GWXa]b\_U\_h]cbYb'VY[Y]ghYfhYb"

## 9]b'j ]Y`ZÀ`h][Yg'Dfc[fUa a 'ZØf';i bX'5`h

<][\`][\hg`XYf`JYfUbghU`hi b['i a ZUgghYb`XUg`hfUX]h]cbY``Y
6]YfZUggfc``Ybž'VY]'XYa 'XYf'? UfbYj U`gWi V`K Y]I XcfZi bX`X]Y
H\Y\_YbVfUg]`]UbYf 'U`g`G]Y[Yf'\Yfj cfhfUhYbž'gck]Y
UVk YWkg`i b[gfY]WkY'6Ø\bYbdfc[fUa a Y`a]h`@j Y!A i g]\_"'5a
GcbbhU[UVYbX`ZUbX`XUg`5VgWk`i gg\_cbnYfhj cb`GUgWkU'5i gh/
: f]YbXg'j cf'Y]bYa '[i h'[YZØ``hYb'A Uf\_h'ghUhh"'Hfchn`XYg
Xi fWkk UWkgYbYb'K YhhYfg'Ua 'GcbbhU[ž'XUg'j cb'GWkUi Yfb
[YdfÀ[h'k Ufž'V`]YV'X]Y'Gh]a a i b['i bhYf'XYb'6Ygi WkYfb
i b[YhfØVhž'XU'\_Y]bY'Ua h`]WkY'I bk YhhYfk Ufbi b['[Y[YVYb'k i fXY"</pre>

 $8 \ Ug'5b[YVch'ZØf'?]bXYf'kifXY'fY[Y`fYWkh'UV[YgU\bhž'hfchn'XYg:Y\Ybg'Y]bYg'?UfiggY``g'''9]b'Gd]Y`VYfY]Wk']b'XYf'?]fWkghfU*Ygck]Y'X]Y'?]hU!C`mad]UXY'ibX'DiddYbh\YUhYf!JcfghY``ib[YbVY[Y]ghYfhYb'X]Y'*Øb[ghYb'''5i*YfXYa'\UhhYb'X]Y'Df]jUh]b]h]Uh]jYbk]Y'XUg'AY\f[YbYfUh]cbYb!NYbhfia'j]Y``ni'V]YhYb'''6YgcbXYfg[ih'kUf'X]Y'FYgcbUbn'UiZ'X]Y'bYiY'6ck`Y!DUfhmž'X]Y'jcb'GjYb:`ÒfghYf'Ua'?U]gYf\cZ'Uig[Yf]WkhYh'kifXY''$ 

## < YfUi gZcfXYfi b[Yb'i bX'JcfZÀ``Y

 $\label{thm:converse} Hfchn: XYg:dcg]h]j Yb:; YgUa hY]bXfi W_g:[UV:Yg:Y]bYb:JcfZU:``Ua:fY]hU[UVYbXž:VY]:XYa Y]b:()!A\f][Yf:A Ubb:Dc:]n]ghYb:Ub[f]ZZ'' 8]YgYf:k i fXY:a ]h:DZYZZYfgdfUm:[Yghcddh:ibX:Yf:]hh:`Y]W\hY JYf:Yhni b[Yb":8Yf:6YUa hY:V`]YV:\]b[Y[Yb:ibj:Yf:Yhnh":Gc:W\Y 9fY][b]ggY:hfØVYb:YXcW\:b]W\h:X]Y:U``[Ya Y]bY:6]:Ubn:XYg::YghYgZXUg:ØVYfk]Y[YbX:U`g:_]bXYfZfYi bX`]W\:ibX:Zf]YX`]W\:VYgW\:f]YVYb k i fXY"$ 

Ni gàhn`]WX 'j YfnY]WX bYhYb 'B cb!: ccX! < ÀbX`Yf 'fØW\_`ài Z][ Y I a gàhnYž'k Ug'X]Y '< YfUi gZcfXYfi b[ Yb ']a J YfUbghU`hi b[ ga Uf\_Yh]b[ 'i bhYfghfY]WX h" '8]Y 'GhUXh 'ghY``h 'XUni Y]bYb '9][ YbUbhY]`'j cb'' ) "\$\$\$ '9i fc 'ZØf'X]Y '8i fWX ZØ\fi b[ 'XYg

: Yghg'VYfY]h"'5i W\'c\bY'XYb'\_`Ugg]gW\Yb': Yghi a ni [ž'XYf']b X]YgYa '\\f'ni f'9bh`Ughi b['XYf'JYfY]bY'Ui gZ]Y`ž'nY][hY'g]W\'XUg 6]YfghUXhZYgh'U`g'UbgdfYW\YbXYg'i bX'[i h'cf[Ub]g]YfhYg'9j Ybh"

8 Y hU]`g	
J c f ZU``	? ÒfdYfj Yf`Yhni b[
Cfh	FUXYVYf[ž'8Yi hgWX`UbX
J Y f`Y hn hY	%
EiY``Yb	• k k k "gUYW\ g]gW\ Y"XY
	• k k k "k c WX Y b _ i f]Y f "] b Zc
	<ul><li>V]YfZYghY!XYi hgWX`UbX"XY</li></ul>

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