

5XY`Y`]b`A ØbWXYb.: Ygh]j U`gh]a a i b[cXYf`YbhhÀi gWXYbXY`Ni gWXUi Yf3

 $< UbbU^*A\ Uf]Y^*VYf]Wk\ hYh^*ØVYf^*]\backslash f^*YbhhÀi\ gWkYbXYg^*5XY^*Y! \\ ?\ cbnYfh^*]b^*A\ ØbWkYb.^*gWk\ UWkYg^*Di\ V^*]_i\ a\ ^i\ bX^*[\ YbYf]\ hY \\ Gh]a\ a\ i\ b[\ "$

5XY`Y`VY[Y]ghYfh`A ØbWXYb``UVYf`XUg Di V`]_i a `V`Y]Vh`\]bhYf`XYb`9fk Ufhi b[Yb ni fØW_

=a '5i [i gh'&\$&('n]Y\h'X]Y'Vf]h]gW\Y'GÀb[Yf]b'5XY'Y']b'A ØbW\YbX]Y'A UggYb'Ub"'5`g'HY]`'j cb'nY\b'?cbnYfhYbž'X]Y']b'XYfVUmYf]gW\Yb'@UbXYg\Ui dhghUXh'ghUhhZ]bXYbž'_cbbhYb'H]W_Yhg'ZØfXUg'9fÒZZbi b[g_cbnYfh'Ua'&"'5i [i gh'Yf[UhhYfh'k YfXYb"'8cW\X]YgYg'9j Ybh'k]fX'b]W\h'bi f'U`g': Y]Yf'XYf'A i g]_'k U\f[Ybca a YbžgcbXYfb'Ui W\'U`g'Gd]Y[Y`V]`X'Y]bYg'VYa Yf_Ybgk YfhYb'HfYbXg']a?cbnYfhVYgi W\"

9fk Ufhi b[Yb Ub @]j Y!DYfZcfa UbWyg

6YgcbXYfg']b'Y]bYf'NY]hž']b'XYf'@]j Y!9bhYfhU]ba Ybh'ni bY\a YbX
Ub'6YXYi hi b['[Yk]bbhž'g]bX'X]Y'9fk Ufhi b[Yb'Ub'?cbnYfhY'\cWX"
8]Y'&&!'À\f][Y':chc!'i bX'J]XYcV'c[[Yf]b'<UbbU'A Uf]Y'Ui g'6Yf']bž
X]Y'XUg'?cbnYfh'VYgi W\hY'i bX']b']\fYa 'DcXWUgh' G\Y g'hU'_]b[
XUfØVYf'gdf]W\hž'Ài »Yfh']\fY'9bhhÀi gW\i b['ØVYf'X]Y'Gh]a a i b[']a
Di V']_i a "' =\W\ 'k Uf'Y]b'V]ggW\Yb'YbhhÀi gW\h ž'gc'<UbbU'A Uf]Y"
8]Y'6Ygi W\Yf'\ÀhhYb'bi f'gdcfUX]gW\'a]h[Ygi b[Ybž'k Ug']\fYf
A Y]bi b['bUW\'X]Y'5ha cgd\ÀfY'qhUf_'VYY]bZi qghY"

9]b J Yf[`Y]WX a]h HUm`cf Gk]Zh

<UbbU'A Uf]Y'n]Y\h'Y]bYb'J Yf[`Y]W\ a]h'XYf'DYfZcfa UbWY'j cb
HUm`cf'Gk]Zhž'X]Y']b'XYf'K cW\Y'ni j cf']b'A ØbW\Yb'Ui ZhfUh'' G]Y
hUbnh'k]f_`]W\ 'XfY]Y]b\U`V'Ghi bXYb'gc'Xi fW\ ž'gU[h'< UbbU'A Uf]Y
ØVYf'Gk]Zh'i bX'Yf_`Àfhž'XUgg'5XY`Y'Ub'X]YgYa '5VYbX'g]W\h`]W\ a]h
XYf'8]ghUbn'XYf'ØVYf'&\$\$'A YhYf'`Ub[Yb'6Ø\bY'ni '_Aa dZYb'\UhhY''
8]Y'_Ua 'gc'[Uf'b]W\h'_`Uf'a]h'XYf'8]ghUbn'i bX'GhfYW_Yž'X]Y'g]Y
k À\fYbX'XYf'@]YXYf'a UbW\a U```Ui ZYb'a i gghY ž'VYf]W\hYh'g]Y''</pre>

8]Y'< YfUi gZcfXYfi b[Yb'XYf 6Ø\bYbdYfZcfa UbW

 $\label{thm:converse} Hfchn: XYf' < YfUi gZcfXYfi b[Yb'VY]: 5XY`Yg'DYfZcfa UbW'`cVh' < UbbU A Uf]Y'X]Y'GÅb[Yf]b'ZØf']\fY'; YgUb[g_ØbghY'' 9g'k Uf'hfchnXYa Y]bY'A Y]ghYf`Y]ghi b[ž'VYa Yf_h'g]Yž'Ui W\'k Ybb'5XY`Y']b']\fYb 9]bgÅhnYb'[Y`Y[Ybh`]W\'j Yf\UgdY`h'k Uf'cXYf'ni 'ZfØ\'Ub[YZUb[Yb\Uh'ni 'g]b[Yb''8]Yg'k]fZh'X]Y': fU[Y'Ui Zž'k]Y'@j Y!DYfZcfa UbW'g j cb'? Øbgh`Yfb'i bhYf'XYb'6YX]b[i b[Yb'[fc\"Yf'6Ø\bYb'i bX A UggYb'k U\f[Ybca a Yb'k YfXYb''$

5XY`Y!K Y`h. '9]b '9f`YVb]g'Ui » Yf\U`V'XYg ?cbnYfhg

5VgY]hg'XYf'Aig]_'VYY]bXfi W_h'XUg'9j Ybh'Ui Wa'a]h'XYf gc[YbUbbhYb' 5XY'Y!K Y'h ž'X]Y'6Ygi WaYf'a]h'5b[YVchYb'k]Y ?UfUc_Y'i bX'Y]bYa 'F]YgYbfUX'Ubn]Y\h''8]Yg'nY][hž'XUgg'X]Y JYfUbghU'hi b[Yb'fi bX'i a 'Y]b'?cbnYfh'YVYbgc'k]Wah]['g]bX'k]Y X]Y'DYfZcfa UbW'gY'Vgh'' <]Yf'_cbbhYb'k]f'XUg': Ygh'a]h'Y]bYa 6]Yf[UfhYb'[Yb]Y» Yb ž'ZfYi h'g]Wa'<UbbU'A Uf]Y''

9]b'[YgY``gWX UZh`]WX Yf'HfYbX.'?cbnYfhY'U`g; Ya Y]bgWX UZhgYf`YVb]g

8]Y'8]g_i gg]cb'ØVYf'XUg'Di V`]_i a 'k]fZh'YXcW\'Y]bY'k]W\h][Y : fU[Y'ni f'5ha cgd\ÀfY'VY]'@j Y!JYfUbghU`hi b[Yb'Ui Z''+b'Y]bYf K Y`hž']b'XYf'[Ya Y]bgW\UZh`]W\Y'9fZU\fi b[Yb'Xi fW\'@j Y! 9bhYfhU]ba Ybh'[YghÀf_h'k YfXYb'gc``hYbž']gh'Yg'VYXYb_`]W\ž'XUgg bi f'k Yb][Y']a 'Di V`]_i a 'U_h]j 'a]ha UWkhYb"'8]Yg'_ÒbbhY'Ui Z'Y]b U``[Ya Y]bYg'D\Àbca Yb'\]bk Y]gYb.'8]Y'A YbgWkYb'gWkY]bYb ni bY\a YbX'dUgg]j YfY'Ni gWkUi Yf'ni 'k YfXYbž'k À\fYbX'X]Y'?i bgh Ui Z'XYf'6Ø\bY'j Yf'Ub[hž'XUgg'g]Y'U_h]j 'hY]`bY\a Yb"

GWX i ggZc [Yfi b[. 9]b 5i Zfi Z ni f HY] bU\a Y

9]b '? cbnYfh'j cb'5XY `Y']gh'b]W h'bi f'Y]b'a i g]_U`]gW Yg'9fY][b]gž gcbXYfb'Ui W 'Y]b'_i `hi fY``Yg'9f`YVb]gžXUg'Yfgh'Xi fW 'X]Y'Y\f`]W Y 6YhY]`][i b['XYg'Di V`]_i a g'`YVYbX]['k]fX"'<UbbU'A Uf]Y'gW\`]Y» h]\fYb'DcXWUgh'a]h'XYa'; YXUb_Ybž'XUgg'gck c\``5XY`Y'U`g'Ui W HUm`cf'Gk]Zh' Dck YfZfUi Yb 'g]bXž'X]Y'Y]bY'ghUf_Y'DfÀgYbn'Ui Z'XYf 6Ø\bY'Ui gghfU\`Ybž'YXcW\'k ØbgW\Yb'k]f'i bg'U`g'Ni \ÒfYf'Y]bY U_h]j YfY'HY]`\UVY"'A i g]_'j YfV]bXYhž'i bX'Yg'`]Y[h'Ub'i bgž'X]YgY JYfV]bXi b['ni 'qhÀf_Yb"

8 YhU]`a

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