

?cbZ`]_h`]a `?`]b]_i a `K Y]a Uf. `?]fWXY _`U[h`[Y[Yb `GhfY]_Ui Zfi ZY `XYf`J YfX]

?`]b]_!6YhfY]VYf']b'K Y]a Uf'_`U[Yb'[Y[Yb'JYfX]ž'i a 'GhfY]_g ni 'j Yf\]bXYfbž'k À\fYbX'DZY[Y_fÀZhY'ZØf'VYggYfY'@Ò\bY _Àa dZYb"

±0 'K Y]a Uf'\UVYb'X]Y'6YgW\ÀZh][hYb'XYg'Gcd\]Yb!'i bX'<i ZY`UbX
?`]b]_i a g']\fYb'l ba i h'ØVYf'X]Y'XYfnY]h][Y'6YnU\`i b['i bX'X]Y
ZY\`YbXY'A]hVYgh]a a i b['[YÀi » Yfh"8]Y'G]hi Uh]cb'\Uh'g]W\']b'XYb
`YhnhYb'A cbUhYb'ni [Ygd]hnhž'k Ug'XUni '[YZØ\fh'\Uhž'XUgg'X]Y
A]hUfVY]hYbXYb'a]h'GhfY]_U_h]cbYb'Xfc\Yb"'8]YgY': cfXYfi b[Yb
hfYZZYb'XUVY]'Ui Z'K]XYfghUbX'gY]hYbg'XYf'9j Ub[Y`]gW\Yb'?]fW\Y']b
A]hhY`XYi hgW\`UbX'fP? A Łž'XYf'8]U_cb]Y'i bX'XYg'?`]b]_i a gž'X]Y
bi b''\f]gh]gW\Y'GW\f]hhY'Y]b`Y]hYb"

if f]gh]gWX Y GWX f]hhY [Y[Yb J YfX]

$8]Y^DYfgdY_h]jY^XYf^6YgWAZh][hYb$

JYfX]'Yf\YVh'YXcW\'9]bgdfi W\'[Y[Yb'X]YgY'5f[ia YbhUh]cb'ibXibhYfghØhnh'X]Y'A]hUfVY]hYbXYb'VY]']\fYb': cfXYfib[Yb'bUW\

 $\label{thm:converse} $$ \O\YfYb @O\bYb" 8]Y ; Yk Yf_gWX UZh_f]h]g]Yfhž XUgg X]Y @O\bY XYf ? `]b]_VYgWX AZh][hYb 'ni a 'HY]` 'Yf\YV`]WX 'i bhYf XYb 'HUf]ZYb 'XYg $$ OZYbh`]WX Yb '8]YbghYg ``]Y[Yb" = a '$ b] 'VYhY]`][hYb 'g]WX 'XU\Yf 'Yhk U &$$ '6YgWX AZh][hY 'Ub 'Y]bYf 'U_h]j Yb 'A]hhU[gd Ui gYž'i a 'Ui Z']\fY 5b`]Y[Yb 'Ui Za Yf_gUa 'ni 'a UWX Yb" '8]Yg 'nY][hž'k]Y 'ghUf_' XYf 8 fi W_j cbgY]hYb 'XYf '6Y`Y[gWX UZh']gh'i bX'k]Y 'k]WX h]['X]YgY H\Ya Yb 'ZØf X]Y 'A]hUfVY]hYb XYb 'g]bX"$

JYfY]bVUfi b[Yb']a '8]U_cb]Yj YfhfU[

8]Y'?]fW\Yž'X]Y'8]U_cb]Y'i bX'XUg'?`]b]_i a 'j Yfk Y]gYb'Ui Z'X]Y
[Y`hYbXYb'5fVY]hgj YfhfU[gf]W\h`]b]Yb'XYf'8]U_cb]Y
A]hhY`XYi hgW\`UbX"'5bZUb['XYg'\J\fYg'k i fXY'Y]bY'@c\bYf\O\i b[j cb'(ž-'DfcnYbh'VYgW\`cggYbž'VY[`Y]hYbX'XUni 'k i fXY'X]Y
K cW\YbUfVY]hgnY]h'j cb'(\$'Ui Z'' - 'Ghi bXYb'fYXi n]Yfh''@Ui h'XYbjYfUbhk cfh`]W\Yb'\Dgh]hi h]cbYb']gh'Ui W\'ZØf'\\$\\$\)'Y]b'k Y]hYfYg@c\bd`i g'j cb') ž('DfcnYbh'gck]Y'Y]b'ni g\hn`]W\Yf'I f`Ui VghU[j cf[YgY\Yb''\Dg[YgUa h'k i fXYb'gY]h'\\$\%'-'@c\bYf\O\i b[Yb'j cb''\\$\ž''DfcnYbh'j YfnY]W\bYh''

6YXYi hi b [ZØf X]Y ; Ya Y]bgW UZh

8]Y'U_hi Y``Y'G]hi Uh]cb'k]fZh'Y]b'GW\`U[`]W\h'Ui Z'X]Y
< YfUi gZcfXYfi b[Yb']a '; Ygi bX\Y]hgk YgYbž']bgVYgcbXYfY']b
_]fW\`]W\Yb'9]bf]W\hi b[Yb''8]Y'GdUbbi b['nk]gW\Yb'XYb
@c\bZcfXYfi b[Yb'XYf'6YgW\ÀZh][hYb'i bX'XYb'fYW\h']W\Yb
FU\a YbVYX]b[i b[Yb'i bhYf'XYa '?]fW\YbfYW\h'nY][h'X]Y
?ca d'Yl]h\h'XYf'5fVY]hgVYn]Y\i b[Yb']b'X]YgYa '6YfY]W\''8]YgY
5i gY]bUbXYfgYhni b['_ObbhY'b]W\h'bi f'5i gk]f_i b[Yb'Ui Z'X]Y
A]hUfVY]hYf'XYg'?']b]_i a g'\UVYbž'gcbXYfb'Ui W\'Ui Z'UbXYfY
9]bf]W\hi b[Yb'['Y]W\Yb'Hmdgž'k Ug'Y]bYb'VfY]hYfYb'HfYbX']b'XYf
6fUbW\Y'k]XYfgd]Y[Y'h''8]Y': fU[Y'bUW\'ZU]fYb'@O\bYb'i bX
A]hVYgh]a a i b['k]fX'ni bY\a YbX'k]W\h][Yfž'k\A\fYbX'_]fW\Y\
5fVY]h[YVYf'j Yfgi W\Ybž']\fY'HfUX]h]cbYb'i bX'[YgYhn']W\Yb
; fi bX`U[Yb'ni 'k U\fYb''

6 Ygi WX Yb 'G]Y 'i bg 'Ui Z. 'b!U["XY