

## : `i [nYi [UVghi fn'VY]'? Ò`b. A chcfZ`i [nYi ['VfYbbh'bUW\'Bch`UbXi b[ Ui g°

5a '&%"\$' "&\$&) 'ghØfnhY'Y]b'\_`Y]bYg'A chcfZi [ nYi [ 'VY] <Ub[ Y`Uf'UV'i bX'VfUbbhY'Ui g"'?Y]bY'JYf`YhnhYb'VY\_Ubbhž: Yi Yfk Y\f']a '9]bgUhn"

< Ub[Y`Ufž'8Yi hgWX`UbX'!'5a ': fY]hU[bUW\a]hhU[ž'XYa '&%"'A Àfn
&\$\&\) ž'\_Ua 'Yg']b'XYf'BÀ\Y'XYg': `i [d`UhnYg'< Ub[Y`Uf']a 'F\Y]b!
G]Y[!?fY]g'ni 'Y]bYa 'hfU[]gWXYb': `i [nYi [UVghi fn"'@Ui h'HU[&(
gWX`i ['Y]b'\_`Y]bYg'A chcfZi [nYi ['[Y[Yb'%\*"' \$'I \f'Ui Z'Y]bYa
: Y`X'Ui Z'i bX'VfUbbhY'j c``ghÀbX]['Ui g"'8]Y': Yi Yfk Y\f'VYghÀh][hYž
XUgg'XUg': `i [nYi ['Ògh`]WX'XYg'5fYU`g'Ui ZgWX`i ['i bX'a]h'Y]bYf
gWXk UfnYb'FUi WXgÀi `Y']b'XYb'<]a a Y``Ui Zgh]Y[ž'X]Y'Ui g'XYf
: YfbY'g]WXhVUf'k Uf"</pre>

FYhhi b[g\_fÀZhY'k i fXYb'i a [Y\YbX'ni f'I bZU``ghY``Y'U`Ufa ]Yfhži a XYb'6fUbX'ni '`ÒgW\Yb"'8fY]'FYhhi b[g\i VgW\fUi VYf'k i fXYb'XYg K Y]hYfYb']b'X]Y'BÀ\Y'XYf'9]gYbVU\bghfYW\_Y'[YgW\]W\_h"

VYffUgW\YbXYfk Y]gY'[]Vh'Yg'XYfnY]h'\_Y]bY'6Yf]W\hY'ØVYf
JYf`YhnhY'cXYf'HchYž'k Ug'VY]'Y]bYa 'gc`W\Yb'I bZU``'i b[Yk Ò\b`]W\]gh"

## < ]bhYf[ fi bX XYf : `i [ g]WX Yf\Y]h

: `i [fY]gYb^[Y`hYb^U`g^Y]bYg^XYf^g]W\YfghYb^JYf\_Y\fga ]hhY`
k Y`hk Y]h"^GhUh]gh]\_Yb^nY][Ybž\*XUgg^X]Y^K U\fgW\Y]b`]W\\_Y]hž^VY]
Y]bYa :: `i [nYi [UVghi fn^ni ghYfVYbž\*Yl hfYa [Yf]b[^]gh^ Yhk U^ l bZÀ``Y^dfc^A]``]cb': `Ø[Y"~a \\\]\f^&\\$\\$'k UfYb^``Ui h^8]Y': U\_hYb GY]hY^`YX][`]W\^%%gW\k Yfk]Y[YbXY^l bZÀ``Y^fY[]ghf]Yfh`k cfXYb" 8 Ybbc W. 'n]Y\Yb': `i [nYi [UVghØfnY'ghYhg'k Y`hk Y]hY
5i Za Yf\_gUa \_Y]h'Ui Z'g]W. "'C Zh'g]bX'Yg'hYW\b]gW\Y'A Àb[Y`ž
a YbgW\`]W\Yg'J YfgU[Yb'cXYf'i b[Øbgh][Y'K YhhYfVYX]b[i b[Ybž
X]Y'ni 'gc`W\Yb'HfU[ÒX]Yb'ZØ\fYb"'6Y]'XYf'5bU`mgY'j cb
:`i [nYi [UVghØfnYb']gh'XYf'a YbgW\`]W\Y': U\_hcf'YbhgW\Y]XYbX/
GW\Àhni b[Yb'ni Zc`[Y'g]bX') \$!\*\$i 'XYf'5VghØfnY'Ui Z'a YbgW\`]W\Y
: Y\`Yf'ni fØW\_ni ZØ\fYbž'Y]bgW\`]Y»`]W\': Y\`\_ca a i b]\_Uh]cbYb'i bX
gW\`YW\hY'9bhgW\Y]Xi b[Yb'i bhYf'8fi W\_"'8]YgY'F]g]\_Yb'k YfXYb
YXcW\'Xi fW\'hYW\bc`c[]gW\Y': cfhgW\f]hhY'i bX'gmghYa Uh]gW\Y
G]W\Yf\Y]hgj YfZU\fYb'\_cbh]bi ]Yf`]W\'j Yff]b[Yfh"

 $8 ]Y ``Yi h][ Yb :: `i [g]WXYfY]hga U >> bU Va Yb `VY]b VU `hYb ghUb XUfX]g]YfhY `G]WXYfY]hgdfØZ b[Yb 'gck]Y `HYWX bc`c[]Yb `k]Y XUg `X][]hU `Y :: `m!Vm!K]fY!GmghYa ž `XUg 'gck c\``X]Y `G]WXYfY]h `U`g Ui WX `X]Y `GhYi Yfi b[ `XYf :: `i [nYi [Y'j YfVYggYfh'' `8]YgY 9bhk]W_`i b[Yb `\UVYb `XUni `[YZØ\fhž `XUgg`]b `XYb ``YhnhYb `>U\fYb X]Y `, VYf `YVYbgfUhY `VY] :: `i [nYi [UVghØfnYb `Ui Z Yhk U'-) | [Ygh]Y[Yb `]gh''$ 

## : Un]h'i bX'5i gV`]W\_

 $\label{thm:converse} Hfchn'XYg'hfU[]gWXYb'JcfZU``g']b'<Ub[Y`Uf'V`Y]Vh'X]Y\\ :`i[g]WXYf\Y]h'U``[YaY]b'\cWXž'ibX'X]Y'KU\fgWXY]b`]WX_Y]h'ZUhU`Y\\ :c`[Yb'Uig'Y]bYa':`i[nYi[UVghifn'ni'Yf`Y]XYbž']gh'Ài <math>\Rightarrow$ Yfgh[Yf]b["'8]Y'9fY][b]ggY'XYg':fY]hU[bUWXa]hhU[g'kYfXYb'g]WXYf`]WXni'Y]bYf'XYhU]``]YfhYb'IbhYfgiWXib['XYg'JcfZU``g'ZØ\fYb"

 $8 ]Y `U\_hi Y``Yb `9bhk ]W\_`i b[Yb `nY][Yb `Y]ba U``a Y\fž`XUggž`cV[`Y]W : `i [nYi [UVghØfnY `gY`hYb `g]bXž`X]Y `HYW\bc`c[]Y `i bX `X]Y `GW\i `i b[XYg `DYfgcbU`g `YbhgW\Y]XYbX `ZØf`X]Y `G]W\Yf\Y]h`]b `XYf`@i ZhZU\fh V`Y]VYb": `]Y[Yb'[]`h`XU\Yf']a `JYf[`Y]W\`ni `UbXYfYb JYf_Y\fqa ]hhY`b `k Y]hYf\]b `U`q `Ui » YfcfXYbh`]W\`q]W\Yf"$ 

8 YhU]`g	
JcfZU``	: `i [ nYi [ UVghi fn
Cfh	<ub[y`ufž'8yi hgw\`ubx<="" td=""></ub[y`ufž'8yi>

8 Y hU]`g	
EiY``Yb	• k k k "hU[ &( "XY
	<ul><li>X]YZU_hYbgY]hY"XY</li></ul>

 $6\,Y\,gi\ WX\,Y\,b\,{}^*G\,]Y\,{}^*i\ b\,g\,{}^*Ui\ Z.\,{}^*b\,!\,U[\ "X\,Y$