

6Yf[YffYhhi b[']b'6UX'FY]WXYb\U``. A ØbWXbYf]b'bUWX'I bZU```a]h <i VgWXfUi VYf'[YfYhhYh

A ØbW\bYf]b'j Yf`Yhnh'g]W\'VY]a '5Vgh]Y['j cb'XYf GW\`Y[Y`a i `XY"'6Yf[k UW\h'i bX'FYhhi b[g\i VgW\fUi VYf']a 9]bgUhn'k Y[Yb'; Yk]hhYf[YZU\f"

±b 'XYb 'VUmYf]gWXYb '6Yf[Yb '_ca a h'Yg ']a a Yf 'k]YXYf 'ni ØVYffUgWXYb XYb '9]bgÀhnYb 'XYf '6Yf[k UWX hž ']bgVYgcbXYfY 'k Ybb XUg 'K YhhYf 'i a gWX 'À[h" 'Gc '[YgWXY\Yb 'Ua '%&" '5i [i ghž 'U `g '[`Y]WX nk Y] 'J Yf `YhnhY ']b 'Y]bYf 'F Y[]cb 'j Yfgcf[h'k YfXYb 'a i gghYbž 'X]Y 'ZØf]\fY 'K UbXYfi b[Yb 'i bX 'fi \][Y 'B Uhi f 'VY_Ubbh ']gh"

I bj cf\Yf[YgY\YbY`K YhhYfVYX]b[i b[Yb ZØ\fYb`ni `FYhhi b[gY]bgÀhnYb

8]Y'6Yf[k UWkh'_UbbhY'Ua 'A cbhU[ž'%&"'5i [i ghž'_Y]bY'Fi\Y" K À\fYbX'Y]b'; Yk]hhYf'Ui Znc[ž'k i fXYb'gck c\`'X]Y'6Yf[k UWkhYb 6UX'FY]WkYb\U``'i bX': fY]`Ugg]b['U`g'Ui Wk'XYf FYhhi b[g\i VgWkfUi VYf' 7\f]ghcd\'%('Ui g'HfUi bghY]b'gcZcfh VYfY]h[Ya UWkhž'i a 'nk Y]'j Yf`YhnhY': fUi Yb'ni 'fYhhYb''8]YgY JcfVYfY]hi b[Yb'g]bX'_f]h]gWkž'XU'JYfÀbXYfi b[Yb']a K YhhYfj Yf`Ui Z'gY\f'gWkbY``ni '[YZÀ\f`]WkYb'G]hi Uh]cbYb'ZØf K UbXYfYf'ZØ\fYb'_ObbYb"

8Yf'Bchfi Z'j cb'XYf'GWX`Y[Y`ai`XY

5a '5VYbXž'_i fn'bUW\'%, 'I\fž'YffY]W\hY'Y]b'Bchfi Z'X]Y 9]bgUhnnYbhfU`Y"'9]bY'(-!^À\f][Y'A ØbW\bYf]b'j Yf`YhnhY'g]W\'VY]a 5Vgh]Y['jcb'XYf'GW\`Y[Y`ai`XY'ibX'nc['g]W\'Y]bYb':i»Vfi W\'ni" A]h'XYf'fUgWXYb'9bhgWXY]Xi b[ž'XYb'<i VgWXfUi VYf'Ubni ZcfXYfbž_cbbhY'gWXbY``Y]bY'BchUfnh\]`ZY'Ua '9]bgUhncfh'VYfY]h[YghY``h k YfXYb"'8]YgY'5fh'XYf'gWXbY``Yb'FYU_h]cb']gh'gY\f'k]WXh][ž'i a VY]'gWXk Yfk]Y[YbXYb'JYf`Yhni b[Yb'X]Y'NY]h'V]g'ni f a YX]n]b]gWXYb'JYfqcf[i b['qc'_i fn'k]Y'a Ò[`]WX'ni '\U`hYb"

8Yf'g_]nn]YfhY'FYhhi b[gY]bgUhn

8 Yf B chUfnhik i fXY dYf K]bXY ni a "J Yf YhnhYb "UV [Y Y UggYb i bX gcf[hY ii a [Y\YbX 'ZØf'X]Y '9fghj Yfgcf[i b ["'5 i Z [fi bX 'XYf a YhYcfc c []gWX Yb '; Y ZU\f 'Yf [f]ZZYb ']bg [YgUa h 'gY W g '6 Yf [fYhhYf ['Y]W nY]h] ['A U» bU\a Yb 'ZØf'XYb 'VcXYb [YV i bXYbYb '9]bgUhnži a gc Zcfh 'Y]b [fY]ZYb 'ni '_ObbYbž 'ZU `g'XYf K YhhYfi a gW k i b ['XYb < i VgWX fUi VYfY]bgUhn i ba Ò [`]WX a UWX hY "'8]Y '? ccfX]bUh]cb nk]gWXYb 'XYb '6 Yf [k UWX hYb i bX 'XYa 'F Yhhi b [gdYfgcbU`]gh YbhgWXY]XYb Xži a 'XYb '6 Yhfc ZZYbYb 'X]Y 'VYgha Ò [`]WX '<]`ZY ni hY]`k YfXYb 'ni '`UggYb"

JYf`Yhni b['Y]bYf'Vf]h]gWXYb'I f`Ui VYf]b k À\fYbX'XYg'5Vgh]Y[g

 $6YfY]hg`Ua ``Jcfa]hhU[\check{z}[Y[Yb`\%\&"`\$'I \setminus f\check{z}'k Uf`X]Y`6Yf[k UW\&h YVYbZU``g`[YZcfXYfh"`9]bY`Vf]h]gW\&Y`I f`Ui VYf]b`k Uf`VY]a ``5Vgh]Y[jca`<cW\&ghUi ZYb`Ui g[Yfi hgW&h`i bX`\UhhY`g]W&`XUg`6Y]b`i bX`XYb 5fa `j Yf`Yhnh"`=\fY`6Y[`Y]hYf`U`Ufa]YfhYb`gcZcfh`X]Y`6Yf[fYhhYfž`X]Yg]Y`j Yfgcf[hYb`i bX`]bg`HU``VYZÔfXYfhYb"`8Yf`HfUbgdcfh`ni f?fY]g_`]b]_`6UX`FY]W&Yb\U```bU\a `Yhk U`Y]bY]b\U`V`Ghi bXYb`]b 5bgdfi W&"`8]Yg`j YfXYi h`]W&hX]Y`K]W&h][_Y]h`XYf`6Yf[k UW&hž`XUUi W&`]a `I f`Ui V`i bj cf\Yf[YgY\YbY`I bZ\A``Y`[YgW&Y\Yb`_ObbYb"$

: Un]h. JcfVYfY]hi b['Ui Z'XUg'l bYfk UfhYhY

8]Y'JcfZÀ``Y'Ua '<cW.ghUi ZYb'i bX']b'XYf'I a [YVi b['a UWXYb XYi h`]W\Z'k]Y'gW\bY```Y]b'5i gZi [']b'XYb'6Yf[Yb'ni 'Y]bYa 'BchZU``k YfXYb'_Ubb"'8Yf'9]bgUhn'XYf'6Yf[k UWXh'YfZcfXYfh'b]W\h'bi f gW\bY``Y'FYU_h]cbYbZ'gcbXYfb'Ui W\'Y]bY'[fØbX`]W\Y'5i gV]`Xi b[i bX'JcfVYfY]hi b['Ui Z'k YhhYfVYX]b[hY'<YfUi qZcfXYfi b[Yb"

 $\label{lem:converse_converse$

8 Y hU1`c

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