

7 ci fgY Cj Yfj]Yk

'GhJZZ'7cbhJWh'8YhJ]`g'

'7cbj Ybcfg'

B Ua Y	9a U]`	5j U]`UV]`]hm	@cWUhjcb	D\cbY
A]bUFcWg	9 9	K YXbYgXUmg'‰1‱ž H\i fgXUmg'‰1!‰	A cfj Yb 6fck b	-',)&'(,

GWXcc``7cbHJWhi±bZcfa Uh]cb

GWkcc`cZ<iaUb]hJYg'UbX'@Ub[iU[Yg

@c\\U||cb. G\\cc``C\\Z|\\\žA\cfj\Yb'6fck\b'6i]\X]b[\z'@\j\Y``&z'&),

CdYb]b['<ci fg. 'A cbXUm'! : f]XUmž - Ua '! ') da

D\cbY.'Ž*%'&'-',)'%*,%

: UI . 'Ž * %'&'-' ,) ', +\$)

9a U]`. '<u>\U`4 i bgk "YXi "Ui</u>

7ci fgY 8YHJ] g

7 fYX]hDc]bhg**

Gi a a UfmcZh\Y 7ci fgY

Gi VYWh5fYU. I a_ W ie S` V 9 W VWd E fg V [We H\]g \ Wb fg Y \ Wb \ U`gc \ VY 'gh \ X]Y X]b \ h\ Y \ Zc \ c k \]b ['gd Y \ WU \]g Uh]c b. : [efack

5ggYgga Ybh

 $D\, `Y\, UgY\, `W\, Y\, \underline{W}\, `fh\, Y\, `A\, cc\, X\, `Y\, `g] hY\, '\, \underline{Z} cf\, 'fh\, Y\, '\, \underline{Z} \, `fb\, .$

k YY_Ł"

5XX]h]cbU`XYhJ]`g.

FYZYf'hc'h\Y''YWhifY'cb'5bU'mm]b['h\Y'd\chc[fUd\'Zcf'\ck'hc'Xc'h\]g']bWiX]b['h\Y'[fcid'YIYfW]gY"

Mci 'bYYX'hc'gi Va]hU'cbY'dU[Y'UbbchUhYX'V]V`]c[fUd\mcb'k\Uhgci fW/g'mci 'Wcbgi 'hYX'Zcf'h\]g'Yl YfW]gYUbX'U'cbY'gYbhYbW'XYgWf]dh]cb'cb'\ck 'YUW\gci fW/\Y'dYX'mci ']b'mci f'UbU'mg]g"

 $H\Y'k\ YY_`mfYUX]b[\ g'UbX'h\Y'k\ Umj\]gi\ U``gci\ fWYg'UfY'UbU`mgYX']b'h\Y'`YWfi\ fYg'g\ci\ `X'[\]j\ Y'mci\ 'f]dg'cb \ck 'hc 'Xc'h\]g'Ug'k\ Y``"$

Hi fb]hjb gYhjb[. H\]g]g bchU Hi fb]hjb Ugg][ba Ybh

5ggYgga Ybh' . F YgdcbgYg hc fYUX]b[g

GhUfh'XUhY.

8 YHU]`g. `Ghi XYbhg`gi Va]h'U`fYgdcbgY`fWU"`) \$\$!*\$\$`k cfXgŁ`hc`gYhei Ygh]cbg`cb`U`k YY_`mfYUX]b[`VYZcfYhk c`hi hcf]U`g": YYXVUW_`]g'j]U`]bX]j]Xi U``Wca a Ybhg`UbX`]b!WUgg`X]gW gg]cb"

5XX]h]cbU`XYhU]`g.

F YgdcbgY 'bc" '%']g'Xi Y 'cb'K YX' >i bY '%&'Vm') da 'UbX'F YgdcbgY 'bc" '&']g'Xi Y 'cb'K YXbYgXUm'>i bY '&* ž'Vm') da "

GYY'h\Y'Z]'Y'cb'Hi hcf]U``fYUX]b[g'UbX'ei Ygh]cbg'Zcf'X]gW gg]cb'f]b'h\Y'A ccX'Y'g]hYŁ'Zcf'h\Y'ei Ygh]cbg'mci bYYX'hc'Ubgk Yf'Zcf'h\Y'fYgdcbgYg'hc'fYUX]b[g'UbX'h\Y'fYUX]b['fYei]fYX"

Hi fb]h]b`gYh]b[.`H\]g`Ugg][ba Ybh]g`gi Va]hhYX`h\fci [\`Hi fb]h]b`UbX`ghi XYbhg`WJb`gYY`Hi fb]h]b`g]a]`Uf]hm fYdcfhg"

5ggYgga Ybh (. F YgYUfW YggUm

GhUfh'XUhY.

8YHJ]`g. 'F YgYUfW\ '9ggUm'Vfc_Yb`Xck b`]bhc—V]V`]c[fUd\mž'UVghfUWhUbX`Z]bU``YggUm'`Gh XYbhg`k f]hY`Ub YggUmfWJ"'` \$\$\$`k cfXgŁ`]b`fYgdcbgY`hc`cbY`cZh\Y`ei Ygh]cbg`i g]b[`gW\c`Ufg\]d`]b`XfYgg`\]ghcfm'': YYXVUW_]g`Vm]bX]j]Xi U``Wca a Ybhg`UbX`U`fi Vf]W

5XX]h]cbU`XYhU]`g.

GYY'h\Y'Z|Y'cb'9ggUmei Ygh]cbg'UbX'V]V`]c[fUd\]Yg'i d`cUXYX`]b'h\Y'A ccX`Y'g]hY'''H\]g'\Ug'h\Y'`]ghcZYggUmei Ygh]cbg'UbX'fYWca a YbXYX'V]V`]c[fUd\]Yg'Zcf'h\]g'Ugg][ba Ybh'

5 gc VWYW h Y A ccXY ZY cb h Y 9 ggUmA Uf Jb[fi Vf]W

 $\label{thm:continuous} \begin{tabular}{ll} Hi & fb & fb & gYM &$

1		ZJg\]cbž'[`cVU`]gUh]cb"
		5fY`h\cgY`k \c`Zc``ck `ZJg\]cb!`ZJg\]cb'j]Wf]a g3
	Hi hcf]U`	GbYU_Yfg. ': Ug\]cbž; YbXYfžGi VW 'h fY
K YY_', .'&&'>i `m!'&*'>i `m	(DUfh% "H\Y"% *\$g!dfYgYbh VfYU_]b['ci hZcf'a Yb UbX'k ca Yb3' DUfh& ': Ya]b]ga g'UbX': Ug\]cb
	; fci d'\$ %	

FYgci fWyg

DfYgWf]VYX F Ygci fWyg

7 ci fgY F YUX]b[g" F YUX]b[g Zcf'h, Y hi hcf]U'g WUb VY UWW ggYX h, fci [\ 'h, Y A ccX`Y G]hY i bXYf'h, Y \YUX]b["7 ci fgY F Ygci fw g"—`cc_ Zcf'h, Y [fYYb`]b_ Ybh]hYX. F Yei]fYX F YUX]b[g Zcf'h, Y 7 ci fgY"

FYWca a YbXYX FYgci fW/g

FYWca a YbXYX HYI h "A]bU F cW/g UbX @ci]gY 9Xk UfXg fl/Xg LZ

FZWBa [f[Ue aX6 dNee [3e[SSV fZW3_Wd[USe f6f][\hcb. "Gi ggYI 5WUXYa]WDfYggž&\$\$+Ł"

Gi [[YghYXFYZYfYbWYg"``>ci fbU'g.``

8SeZ[a`FZWack

 $FWf[W] 3 < agd S^aX5 afZ SV 5gfgdW$

=fYWca a YbX'i g]b['h\YgY'ci fbU'g'h\Uhh\Y`]VfUfm'\c`Xg']b'Y`YWfcb]WZcfa "``Mci 'k]```Z]bX``chg`cZfYUX]b[g mci 'Wci 'X'a]bY'Zcf'mci f'YggUmg"'`GYY'U`gc'h\Y'V]V`]c[fUd\mdfcj]XYX']b'h\Y'YggUm`]gh''=ZU'Vcc_jg'\Y`X'Uh h\Y'7c``Y[Y'cZ:]bY'5fhg'fk Y'g\UfY'gci fWYg'k]h\'h\Ya Łž'↑ghfYei Ygh]hi g]b['h\Y'hUVž'UbX']hk]``VY'gYbhhc?Ybg]b[hcb'WJa di g']b'U'XUmcf'lk c"

K YVq]hYq

 $= fYWca \ a \ YbX`WXYW_]b[\ '6`cca \ gVi \ fmdfYgg'XfYgg`UbX`ZJg\]cb`gYf]Yg''``H\Ymdi \ V`]g\YX`a \ cghcZh\Y`Vcc_g \ cb`XfYgg`fgc`]h]g`WJ``YX`h\Y`XfYgg`dfYggŁ''$

7 ci fqY'9j U'i Uhcb'UbX'8Yj Y'cda Ybh

7 ci fgYgʻUfYʻdYf]cX]WU``mfYj]Yk YXʻUbXʻghi XYbhgʻʻZYYXVUW_ʻ]gʻi gYXʻhcʻ]a dfcj Yʻh\Ya "': YYXVUW_ʻ]g [Uh\YfYX`i g]b[ʻj Uf]ci gʻa YUbgʻ]bWi X]b[ʻl BGK ʻgʻa m9l dYf]YbWY"'HYUW\]b[ʻ9j U`i Uh]cbgʻWcbXi WhYX`]b &\$%%`gi [[YghYX`Uʻg`][\hXYXi Wh]cbʻ]bʻh\Yʻbi a VYfʻcZfYgdcbgYgʻhcʻhi hcf]U``ei Ygh]cbg"'=fYXi WYXʻh\Ya ʻZfca + hcʻ*j]b`&\$% žʻh\YbʻZfca '* hcʻ) ʻ]b`&\$%) žʻZfca ') hcʻ]b`&\$% žʻUbXʻZfca '(hc`&`Zcf`&\$% "'`Ghi XYbhgʻYbʻcmYX h\YD\chc[fUd\]WYI YfW]qY`k\]W\Jgʻh\Y]fʻW\UbWYʻhc`Xcʻcf][]bU`ʻfYqYUfW\"

C b 'h\Y'k \c`YžYj U`i Uhjcbg 'Zcf'h\Y'Wti fgY'\Uj Y'VYYb'j Yfmdcg]hj Y"'A cghcZh\Y'Wta a Ybhg``]_Y'h\Y'hi hcf]U`fYqdcbqYg'UbX'a Ubm'Zci bX'h\Y'X]j Yfq]hmcZhcd]Wg'UbX'WUqY'qhi X]Yg']bhYfYqhb["'

Gi Va]gg]cb cZ5ggYgga YbhHUg_g

Gi Va]gg]cb cZ5ggYgga YbhHUg_g

Hi fb]h]b Gi Va]gg]cb

_Zmci YbWci bhYf'U'dfcV`Ya 'k \Yb'UhYa dhJb['hc'gi Va]hmci f'Ugg][ba Ybhh\fci [\ 'Hi fb]hJbž'd`YUgY
hY`Yd\cbY'9| hYfbU``Gi ddcfhcb'-',) '' ' ' %cf'Ya U]`'h\Ya 'cb'Y! hYfbU`hY`hgi ddcfh4 i bgk "YXi "Ui '"'Gi ddcfh
\ci fg'UfY', .\$\$Ua '-'%\$.\$\$da 'cb'k YY_XUmg'UbX'-.\$\$Ua '-') .\$\$da 'cb'k YY_YbXg'fl *) 'XUmg'U'mYUft'' =Zmci
UfY'i bUV`Y'hc'gi Va]hmci f'Ugg][ba YbhXi Y'hc'U'ZUi 'hk]h\'Hi fb]hJb'mci 'a Um'Udd'mZcf'Ub'Y! hYbg]cbžVi hmci
a i ghfYhU]b'mci f'hJW_Yhbi a VYf'Zfca '9! hYfbU``Gi ddcfhfU'cb['k]h\'Ubmch\Yf'fY`Yj UbhXcW a Ybhgt'hc
]bWi XY'Ug'Yj]XYbW'hc'gi ddcfhmci f'Y! hYbg]cb'Udd`]WUhJcb'' =Zmci 'Ya U]`'9! hYfbU``Gi ddcfhmci 'k]``

5 WUXYa | W < cbYghmUbX D`U[| Uf]ga

D`U[]Uf]ga i]gii g]b[ih\Yik cfXgicfi]XYUgicZch\YfgiUbXidfYgYbh]b[ih\Ya iUgimci fick b"i±iWUbihU_Yia Ubm Zcfa qžZfca iXYi]VYfUhYiW\YUh|b[ihciUVW]XYbhU`mWcdm]b[iZfca iUigci fWik]h\ci hiUW_bck iYX[Ya Ybh'i

IBGK '[fci dg'd'U[]Uf]ga ']bhc'h\Y'Zc``ck]b['WUhY[cf]Yg.

7 cdm]b[.'i g]b['h\Y'gUa Y'cf'j Yfmg]a]`Uf'k cfXg'hc'h\Y'cf][]bU`hYl h'cf']XYU'k]h\ci h'UW_bck `YX[]b['h\Y gci fW'cf'i g]b['ei chUh]cb'a Uf_g"'H\]g'U`gc'Udd`]Yg'hc']a U[Ygž'Ufh'UbX'XYg][b'dfcYWhgž'Ug'k Y``'Ug dfYgYbhUh]cbg'k \YfY'gca YcbY'dfYgYbhg'Ubch\Yf'g']XYUg'cf'k cfXg'k]h\ci h'WfYX]h'

⇒ Uddfcdf]UhY 'dUfUd\fUg]b[...7\Ub[]b['U'ZYk 'k cfXg'UbX'd\fUgYg'k \]'Y 'a cghmfYhJ]b]b['h\Y'cf][]bU` ghfi Wh fY 'UbX#cf'dfc[fYgg]cb'cZ]XYUg'cZh\Y'cf][]bU'žUbX']bZcfa Uh]cb'k]h\ci hUW_bck `YX[Ya Ybh'H\]g'U`gc Udd`]Yg']b'dfYgYbhUh]cbg'k \YfY'gca YcbY'dUfUd\fUgYg'Ubch\Yf'g']XYUg'cf'k cfXg'k]h\ci hWfYX]hUbX'hc d]YW]b['hc[Yh\Yf'ei chYg'UbX'dUfUd\fUgYg']bhc'U'bYk 'k \c`Yžk]h\ci hUddfcdf]UhY'fYZYfYbW]b["

7 c``i g]cb. 'k cf_]b['k]th 'cth Yfg'Vi hidUgg]b['cZZth Y 'k cf_'Ug'U'dYfgcb'g']bX]j]Xi U``k cf_"'7 c``i g]cb'U`gc]bWi XYg'dfcj]X]b['mci f'k cf_'thc'Ubcth Yf'ghi XYbh'VYZcfY'th Y'Xi Y'XUHYZcf'Zcf'th Y'di fdcgY'cZth Ya

5 WUXYa]W = b Zcfa Uh cb.

: cf`YggYbhJU``gh XYbh`]bZcfa UhJcb`fY`UhJb[hc.

- fYei Yghg Zcf Yl hYbg]cb/
- `UhY`gi Va]gg]cbg`[i]XY`]bYg/
- fYj]Yk 'cZa Uf_g/
- I BGK '< YU`h\ 'UbX'GUZYhmdc`]\\\Yg/
- YI Ua]bUh]cb dfcWYXi fYg/
- gdYWJU``Wcbg]XYfUhjcb`]b`h\Y`Yj YbhcZ]``bYgg`cf`a]gUXj Ybh fY/
- qh XYbhYei]hmUbX X]gUV]`]hm/
- UbX'ch\Yf'YggYbhJU`'UWUXYa]W]bZcfa UhJcbž'gYY

\hdg.#k k k "Uffg"i bgk "YXi "Ui #W ffYbhgh XYbhg#UWUXYa]W]bZcfa Uf]cb#dfchcWc`g![i]XY`]bYg#

.

⇒a U[Y'7fYX]h

 $\label{eq:local_bound} $$H\setminus]g^*]g^*U^*d\setminus chc^*=hcc_*cZU^*W^*ca^*]b[^*cZU[^Y^*W^*YVfUh]cb^*]b^*DUXcj^*U^*.$

7F = 7CG

7F = 7 C G 'Dfcj]XYf'7cXY. '\$\$\$-,;