A UWX Y hY '5 hhUW_ 'Gd Uf_g'Ci hfU[Y'5 ZhYf; Ug'GhUh]cb'5f[iaYbh']b'?]gg]aaYY

5 '?]gg]a a YY 'a Ub 'ZUWYg 'ZY `cbm'W\ Uf[Yg 'UZhYf 'U '[Ug 'ghUh]cb Uf[i a Ybh 'YgWU `UhYX 'hc 'U 'a UW\ YhY 'UhhUW_ž ']b '\ f]b['hk c"



?]gg]a a YYž: `cf]XUžI G5 ! : +b 'U'ghUfh`]b['hi fb 'cZ'Yj Ybhgž'U j YfVU``X]gdi hY 'Uh'U'?]gg]a a YY'[Ug'ghUh]cb 'YgWU`UhYX']bhc 'U j]c`Ybh'UhhUW_']bj c`j]b['U'a UWXYhYž``YUj]b['h\Y'Wca a i b]hm`]b g\cW_"'5\W\cfX]b['hc' < YUX`]bYgi fZYfž'5b[Y``&Y``F Ua cg!5f\W'ž') ž'k Ug'UffYghYX'cb'\$ bY'- ž'&\$&) ž'Zc``ck]b['h\]g'hfci V`]b[]b\W\XYbh"

H\Y`WcbZfcbhUh]cb`VY[Ub`Uh`U`7]fWY`? 'ghUh]cbž'fYdcfhYX`m'cjYfFUacg!5fW g`\UfUggaYbh'cZ'h\Y'g]ghYf'cZ'h\Y'j]Wh]až'6fmUbChYfc!8]Un"'K\Uh']b]h]U``m'ghUfhYX`Ug`U'jYfVU``YIW\Ub[Y'ei]W_`mhcc_'U'hifb`Zcf'h\Y'kcfgY`Ug`FUacg!5fWY'ib`YUg\YX'j]c`YbWYžZ]fgh'ig]b['U'[UfXYb]b['hcc``VYZcfY'[fUVV]b['U'aUW\YhY'hc'UhhUW_ChYfc!8]Un"'5ZhYf'h\Y'UggUi`hž\Y'hfUbgdcfhYX'h\Y']b'\fYX'aUb'hc

 $h\ Y\ \ cgd\]hU\ \ \check{z}\ U\ XY\ hU]\ \ h\ \ Uh\ UX\ Xg\ \ hc\ \ h\ Y\ \ Wca\ d\ Y\ I\]hm\ \ c\ Z\ h\]g$ $X\]ghi\ fV\]b\ [\ \ g]hi\ \ Uh\]c\ b\ "$

A i h]d Y J Wh]a g Ub X 9j X Y b WY

@UK YbZcfWYa YbhcZZ]W]U`gʻfYdcfhYX`h\Uhʻh\Y`WcbZfcbhUh]cb`X]Xb h cb`mʻUZZYWhʻChYfc!8]Un"ʻ5ʻgYWcbXʻj]Wh]a 'YbXi fYX`U`Vfc_YbʻbcgY UgʻUʻfYgi `hʻcZʻF Ua cg!5fWY gʻU[[fYgg]j Y`VY\Uj]cf"ʻ6`ccX`VY`]Yj YX hcʻVY`cb['hcʻChYfc!8]Unʻk Ugʻ`UhYfʻX]gWcj YfYX`]bʻF Ua cg!5fWY g hfi W_žʻU`cb[g]XY`h\Y`a UW\YhY`i gYX`]bʻh\Y`U`hYfWUh]cb"ʻGi W\Yj]XYbWY`\Ugʻ`YX`h\Y`CgWYc`U`7ci bhmʻG\Yf]ZZgʻCZZ]WY`hcʻgYY_ UXX]h]cbU``]bZcfa Uh]cbʻUVci hʻh\Y`i bZc`X]b['Yj Ybhgʻ`YUX]b['i dʻhch\]gʻ\Uffck]b[']bW]XYbh"

H\Y'[fUj]hm'cZ'g]hi Uh]cbg``]_Y'h\]g'WUbbch'VY'cjYfghUhYXž
YgdYW]U``m'Wcbg]XYf]b['h\Y'U`Ufa]b['ghUh]gh]Wg'giffcibX]b['j]c`Ybh
]bW]XYbhg']b'cifghUhY"'=b'&\$&\$ž:`cf]XU'XcW'aYbhYX'cjYf'%\$*ž\$\$\$
WUgYg'cZ'XcaYgh]Wj]c`YbW'ž'Ug'fYdcfhYX'Vm':`cf]XUg': Ua]`]Yg"
H\]g']bWiXYX'acfY'h\Ub'*'ž\$\$\$'UffYghg'UbX'YIhYbg]jY'giddcfh
gYfj]WYg'dfcj]XYX'hc'j]Wh]agž'Yad\Ug]n]b['h\Y'bYYX'Zcf
Wcaaib]hm'UkUfYbYgg'UbX']bhYfjYbh]cb"

I bXYfghUbX]b['h\Y'6fcUXYf'7cbhYl h

 $\label{thm:linear} H\Y': `cf]XU'8YdUfha Ybh'cZ'< YU`h\`U`gc'g\YXg'`][\h'cb'h\Y VfcUXYf'di V`]W\YU`h\`]a d`]WUh]cbg'cZ'j]c`YbWY']b'ci f Wca a i b]h]Yg'''5WWcfX]b['hc'XUhU'dfcj]XYX'Vm': @< YU`h\ 7 < 5 F HGž i bXYfghUbX]b['h\Y'dUhhYfbg'UbX'i bXYf`m]b[']ggi Yg']b'Xca Ygh]W j]c`YbWY']g'Wfi W]U`'Zcf'YZZYWh]j Y'dfYj Ybh]cb'ghfUhY[]Yg''' < ck Yj Yfž h\Y'XUhU'gYh'g\ck g'h\Uh'h\Y'W]fW'a ghUbWYg'UfY'Z'i]Xž'cZhYb$

X]ZZYf]b['Zfca 'Wci bhm'hc'Wci bhmža U_]b['Wca dfY\Ybg]j Y'UbU`mg]g Vch\']bX]gdYbgUV`Y'UbX'W\U``Yb[]b["

5g'k Y'fYZYWh'cb'h\Y'hfci V`]b['Yj Ybhg']b'?]gg]a a YYž']h'gYfj Yg'Ug U'fYa]bXYf'h\Uh'Wca a i b]hm'j][]`UbW'UbX'gi ddcfh'gmghYa g'UfY YggYbh]U`']b'Wca VUh]b['Xca Ygh]Wj]c`YbW'''K Y'a Um'bch'[fUgd'h\Y Z'\'Yl hYbh'cZ'h\YgY']ggi Yg'Xi Y'hc'i bXYffYdcfh]b[ž'Vi h'Vm ZcghYf]b['Uk UfYbYgg'UbX'YbWci fU[]b['cdYb'Wcbj YfgUh]cbgž'k Y WUb'WfYUhY'U'gUZYf'Ybj]fcba Ybh'Zcf'Yj YfmcbY''

H\Y`fYWYbh`a UW\YhY`UhhUW_`g\YXg``][\h`cb`h\Y`dfYgg]b[`bYYX`Zcfcb[c]b[`YXi WUh]cb`UbX`Uk UfYbYgg`]b`ci f`Wcaaib]h]Yg"`Hc[Yh\YfžkY`\UjY`hc`Ybgi fY`Yj YfmcbY`i bXYfghUbXg`h\Uh`\Y`d`]g`Uj U]`UV`YžUbX`kY`aigh`UWh]jY`m`kcf_`hc`VfYU_`h\Y`WhWY`cZj]c`YbWY"

8 YhU]`g	
Cfh	?]gg]a a YYž: `cf]XUž'I G5
EiY``Yb	• k k k "\YUX`]bYgi fZYf"Wca
	• kkk"a mZ`ZUa]`]Yg"Wca
	• k k k "Z`\YU`h\W\Ufhg"[cj

6 Ygi W Yb G]Y i bg Ui Z a Y]b!k]Yb bYh