

ARTS1690

H\Y'Ghfi WhifY'cZ@Ub[iU[Y

HYfa 'C bY''##'&\$&%

7ci fgY⁻Cj Yfj]Yk

GHJZ7cbHJWh8YHJ]`g

7cbj Ybcfg

B Ua Y	9a U]`	5j U]`UV]`] m	@cWUh]cb	D\cbY
A Yb[]gh '5a VYfVYf	a "Ua VYfVYf4 i bgk "YXi "Ui	H65	A 6&(%	f\$&Ł-\$*))*\$)

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'&),

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D\cbY.'Ž*%'&'-',)'%*,%

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

7ci fgY 8YHJ] g

7 fYX]h'Dc]bhg '* '

Gi a a UfmcZh\Y 7ci fgY

 $H\g`Wci fgY`]g`Ub`]bfcXi Wf]cb'hc``]b[i]gh]Wg`fh\Y`gW]Ybh]Z]Wghi XmcZ`Ub[i U[YŁ'UbX`ZcWi gYg`cb'h\Y hfUX]h]cbU``WcfY`UfYUg`cZ`Ub[i U[Y`ghfi Whi fY`]bWi X]b[.'h\Y`gci bX`gmghYa `fd\cbYh]Wg`UbX`d\cbc`c[młźa cfd\c`c[mfk cfX`ghfi Whi fYŁź'gmbhUl `fWUi gY`UbX`gYbhYbWl`ghfi Whi fYŁź'UbX`a YUb]b[`fgYa Ubh]Wg`UbX$

5ggYgga Ybh

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5ggYgga Ybh'hUg_	K Y][\h	8iY'8UHY	Gh XYbh@YUfb]b[Ci hWca Ygʻ5ggYggYX
< ca Yk cf_'DfcV'Ya 'GYhg'	' \$1	Bch5dd`]WUV`Y	&ž˙(
±b!WUgg⁻hYghi	' \$ı	\$%#\$(#&\$&%`%&.\$\$`DA	%ž [*] (
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5ggYgga Ybh8YlU]`g

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GhUfhXUhY. Bch5dd`]WUV`Y

8YHJ]`g.

G\cfhYl YfW]gYg'hc'VY'Wca d'YhYX'k YY_`mUbX'gi Va]hhYX'cb`]bY"

=b! WUgg [YbYfU`cfU`UbX'k f]hhYb ZYYXVUW_]g'dfcj]XYX"

5ggYgga Ybh& =b!WUgg hYgh

8 YW] g.

*\$!a]bi hY hYghWcj Yf]b['h\Y WcbhYbhcZ`YWi fYg UbX h hcf]U`g"

; YbYfU`'UbX']bX]j]Xi U``k f]hhYb'ZYYXVUW_']g'dfcj]XYX"

 $\label{thm:limit} \begin{tabular}{ll} Hi & fb & fb & gYh &$

5ggYgga Ybh' . :]bU`9l Ua

8 YHJ]`g.

&`\fg'YI Ua 'Wcj Yf]b['U``'h\Y'a U'cf'hcd]Wg'cZh\Y'Wci fgY"

H\]g`]g`h\Y`Z|bU``UggYgga YbhZcf`UhYbXUbWY`di fdcgYg"

 $\label{thm:limit} \begin{tabular}{ll} Hi & fb & fb & gYh &$

5 https://bxubww.Fyei]fyaybhg

 $5\,\text{hh}/\text{b}\text{XUbW}\text{``cZhi hcf]}\text{U`g']g'a Ub}\text{XUhcfm]}\text{b'h}\text{]g'Wci fg}\text{'''}5\,\text{hh}/\text{b}\text{XUbW}\text{'']g'h}\text{_Yb'Uh'h}\text{Y'hi hcf]}\text{U`g''}\text{I bYI W gYX}$ UVgYbW``Zhca 'a cfY\$%\$

5df]`	Hi hcf]U`	D\cbc`c[mYlYfWjgYg"	
	Cb`]bY'5Whjj]hm	D\cbc`c[mYlYfW]gYg"	
K YY_"%\$."%-"5df]`"!"&"	@YWhifY	Gi a a UfmUbX fYj]g]cb cZVUg]WWcbWrdrg"	
5df]`	Hi hcf]U`	; YbYfU``X]gW gg]cb`cb`gca Y`cZh\Y`_Ymhcd]Wg Wcj YfYX`]b`h\Y`Wci fgY"	
	Cb`]bY'5WMj]hm	FYj]g]cb'ei Ygh]cbg'UbX'YI YfW]gYg"	

FYgci fWYg

DfYgWf]VYX F Ygci fWYg

F Yei]fYX'hYl hVcc_, : fca _]bž'J "'Yh'U`"'&\$% "'5b' +bhfcXi Whjcb'hc'@Ub[i U[Yž'-h\'5i ghfU`]Ub#BYk 'NYU`UbXYX]h]cbž7Yb[U[Y"

 $\label{eq:KYVg} $$KYVg]hYg.^9h\bc\c[iY/I7@5d\cbYh]Wg.^UV$$

Gi Va]gg]cb cZ5ggYgga YbhHUg_g Hi fb]h]b Gi Va]gg]cb

⊋mci 'YbWci bhYf'U'dfcV`Ya 'k \Yb'UhhYa dh]b['hc'gi Va]h'mci f'Ugg][ba Ybh'h\fci [\'Hi fb]h]bž'd`YUgY

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=hWJbihU_Yia Ubm Zcfa gžZfca iXYi]VYfUhYiWXYUh]b[ihciUWW]XYbhU`mWcdm]b[iZfca iUigci fWYik]h\ci hiUW_bck iYX[Ya Ybh'

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

• i bXYfgHJbX'mci f'f][\hg'UbX'fYgdcbg]V]`]h]Yg'Ug'U'gh XYbh'Uhil BGK

5 WUXYa]W + DZcfa Uhjcb

: 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 GUZYmdc`]W[Yg/
- YI Ua]bUh]cb dfcW/Xi fYg/
- gdYWJU``Wcbg]XYfUHjcb']b'H\Y'Yj YbhcZ]``bYgg'cf'a]gUXj Ybh fY/
- gh XYbhYei]hmUbX'X]gUV]`]hm/
- UbX'ch\Yf'YggYbhJU`'UWUXYa]W]bZcfa UhJcbž'gYY