

ARTS3048

; ch\]W7i `hi fYg. '@]hYfUhi fY 'UbX 'GWfYYb

GYa YghYf'C bY''##'&\$%

7ci fgY[.]Cj Yfj]Yk

7 ci fgY 8YHJ]`g 7 fYX]hDc]bhg ** $\label{thm:condition} $$H\YfY'k]``VY'' Zcfa g'cZUggYgga Ybhžik c'YggUmg'UbX'cbY']b!WUgg'dfYgYbhUh]cb"'H\Y']b!WUgg dfYgYbhUh]cb'k]``Wcbg]ghcZU'%$'a]bi hY'cfU''dfYgYbhUh]cb'h\UhiXfUk g'cb'h\Y') $$'k cfX'V'c['dcghYX'Vm') da h\Y'dfYj]ci g'XUm'''Ghi XYbhg'k]```VY'fYei]fYX'hc'dfcXi W''U'dck Yf'dc]bhUg'dUfhcZh\Y]f'cfU''dfYgYbhUh]cb h\UhiK]```VY'gi Va]hYX'Ug'dUfhcZh\Y'UggYgga Ybh''H\Y'fUh]cbU'Y'Zcf'h\YgY'Zcfa g'cZUggYgga Ybh']g'hc'ZcghYf U'VU'UbW''cZk f]hYb'U'Wf]hWU''g_]``g''''H\Y'V'c[#cfU''dfYgYbhUh]cb']g'U'gc'dfc[fYgg]j Y`mUggYggYXž'gc h\Uhighi XYbhg'k]```\Uj Y'ZYYXVUW_cb'&'Ugg][ba Ybhg'Xi f]b['h\Y'Wci fgY'UbX'Ub'cddcfhi b]hmhc'X]gW'gg'h\Y]f k cf_''''$

5ggYgga Ybh

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 $B6. + b cfXYf + c dUgg + h g Wc i fgYzmc i a i gha U_Y U gYf]c i g UhhYa dh Uh 5 @ UggYgga Ybh HUg_g " i g UhhYa dh Uh 5 & UggYgga Ybh HUg_g " i g UhhYa dh Uh 5 & UggYgga Ybh HUg_g " i g UhhYa dh Uh 5 & UggYgga Ybh HUg_g " i g UhhYa dh Uh 5 & UggYgga Ybh HUg_g " i g UhhYa dh Uh 5 & UggYgga Ybh HUg_g " i g UhhYa dh Uh 5 & UhhYa dh Uh 5 & UggYgga Ybh HUg_g " i g UhhYa dh Uh 5 & UggYgga Ybh HUg_g " i g UhhYa dh Uh 5 & UhhYa dh$

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5ggYgga Ybh'HUg_g'

5ggYgga Ybh'tUg_	K Y][\h	8iY'8UhY	Gh XYbh@YUfb]b[CihWca Ygʻ5ggYggYX
7 f]h]WU``UbU`mg]g`	' \$1	%\$#\$(#&\$% `\$).\$\$`DA	%ž&Ž Ž(ž) ž*
A U^cf`Wf]h]WU``YggUmi) \$1	\$, #\$) #&\$% `\$).\$\$`DA	%ž&Ž ž(ž) ž*
6`c[#GYa]bUf`dfYgYbhUh]cb`	&\$ı	' %#\$) #&\$&\$`\$).\$\$`DA	%ž&ž ž(ž) ž*

5ggYgga Ybh8YHJ]`g

5ggYgga Ybh'% 7f]h]WU`UbU`mg]g

GhUfhXUhY. Bch5dd`]WUV`Y

@Yb[h\.'%) \$\$'k cfXg

Gi Va]gg]cb cZ5ggYgga YbhHUg_g

Gh XYbhg UfY Yl dYWYX hc di hh\Y]f bUa Yg UbX gh XYbhbi a VYfg cb Yj YfmdU[Y cZh\Y]f Ugg][ba Ybhg"

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

Imagi YbWci bhYf'U'dfcV'Ya 'k \Yb'UthYa dr]b['rc'gi Va]hmci f'Ugg][ba Ybht\fci [\'Hi fb]r]bž'd'YUgY hY'Yd\cbY'9I hYfbU'Gi ddcfhcb'-',) "''' %cf'Ya U] hYa 'cb'<u>Yl hYfbU'hY'hgi ddcfh4 i bgk "YXi "Ui"</u> "Gi ddcfh \ci fg'UfY', .\$\$Ua '-'%\$.\$\$da 'cb'k YY_XUmg'UbX'-.\$\$Ua '-') .\$\$da 'cb'k YY_YbXg'fl *) 'XUmg'U'mYUft'" Imai UfY'i bUV'Y 'rc'gi Va]hmci f'Ugg][ba YbhXi Y'rc'U'ZJi 'hk]h\ 'Hi fb]h]b'mci 'a UmUdd'mZcf'Ub'YI hYbg]cbž'Vi hmci a i ghfYhJ]b'mci f'h]W_Yhbi a VYf'Zfca '9I hYfbU''Gi ddcfhfU'cb['k]h\ 'Ubmch\Yf'YYj UbhXcW a Ybhgt'rc]bWi XY'Ug'Yj]XYbW' 'rc'gi ddcfhmci f'Yl hYbg]cb'Udd']WUh]cb" Imai 'Ya U]''9I hYfbU''Gi ddcfhmci 'k]'`Ui hca Uh]WU''mfYWf]j Y'U'h]W_Yhbi a VYfž'Vi h]Zmci 'hY'Yd\cbY'mci 'k]'''bYYX'rc'gdYW]ZWU''mUg_'Zcf'cbY" Hi fb]h]b'U'gc'dfcj]XYg'i dXUhYg'cb'h\Y]f'gmghYa 'ghUh' g'cb'Hk]hYf"

; YbYfU`mž'UggYgga YbhitUg_g'a i ghVY'gi Va]hhYX'Y`YWfcb]WU``mj]U'Y]h\Yf'Hi fb]h]b'cf'U'A ccX`Y Ugg][ba Ybh''=b']bghUbWfg'k \YfY'h\]g']g'bchdcgg]V`Yž']hk]```VY'ghUhYX'cb'mci f'Wci fgY'g'A ccX`Y'g]hY'k]h\U`hYfbUh]j Y'gi Va]gg]cb'XYhU]`g"

@UhY 5ggYgga Ybh'DYbU`h]Yg

5b'UggYggYX'HUg_']g'XYYa YX``UhY']Z]h']g'gi Va]hhYX'UZhYf'h\Y'gdYW]Z[YX'h]a Y'UbX'XUhY'Ug'gYhci h']b'h\Y Wci fqY'@YUfb]b['A UbU[Ya YbhGmqhYa 'f@A GŁ"

$$\label{thm:condition} \begin{split} &\text{H}^{\text{U}$$

K cf_'gi Va]hhyx'zci fhyyb'fl%(EXUmg'Uzhyf'h\y'Xi Y'XUhy'k]``VY'a Uf_YX'UbX'zYYXVUW_'dfcj]XYX'Vi hbc'a Uf_ k]``VY'fYWcfXYX"'=Zh\Y'k cf_'k ci `X'\Uj Y'fYWr]j YX'U'dUgg'a Uf_'Vi hzcf'h\Y'`UhybYgg'UbX'h\Y'k cf_']g'U Wca di `gcfm'Wci fgY'Wca dcbYbhz'U'gh XYbh'k]``VY'XYYa YX'hc'\Uj Y'a Yhih\UhfYei]fYa Ybh''H\]g'XcYg'bch Udd`mhc'U'hUg_'h\Uh']g'UggYggYX'Vi hbc'a Uf_']g'Uk UfXYX"

K cf_'gi Va]hh/X'hk YbhnlcbY'f&&XUmg'UZhYf'h\Y'Xi Y'XUhY'k]```bchVY'UWWdhYX'Zcf'a Uf_]b['cf'ZYYXVUW_UbX'k]```fYWY]j Y'bc'a Uf_'cf'[fUXY"'=Zh\Y'UggYgga YbhHUg_']g'U'Wca di `gcfmWca dcbYbhcZh\Y'Wci fgY'Ugh XYbhk]```Ui hca UhJWU``mZU]`'h\Y'Wci fgY"

GdYWJU`7cbg]XYfUhJcb55dd`]WUhJcbg

 $\label{eq:linear_continuity} $$Mc_i = W_0 - W_$

G]W_bYggža]gUXj Ybhi fY'cf'ch\Yf'W]fW a ghUbWrg'VYmcbX'mci f'Wcbhfc``a Um

ł DfYj Ybhimci Zfca Wca d`Yhlb[U.Wci fqY fYei]fYa Ybhž

ł? YYd mci Zfca 'UthYbX]b['Ub 'UggYggUV`Y 'UWhj]tmž

ł Ghod moi gi Va]hh]b['UggYggUV'Y'k cf_ Zcf'U'Wci fgYž

ł `G][b]Z]\WbhmUZZY\Wimci f`dYfZcfa Ub\Wr`]b`UggYggUV`Y`k cf_ž`VY`]h'U`Zcfa U``YbX!cZgYa YghYf`Yl Ua]bUh]cbž`U`\WUgg`hYghž`U``UVcfUhcfmihYghž`U`gYa]bUf`dfYgYbhUh]cb`cf`Ubmch\Yf`Zcfa 'cZUggYgga Ybh'

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

D`U[]Uf]ga `]g`i g]b['h\Y`k cfXg`cf`]XYUg`cZch\Yfg`UbX`dfYgYbh]b['h\Ya `Ug`mci f`ck b"'\lefi\Wb'hU_Y`a Ubm Zcfa gžZfca `XY`]VYfUhY`W\YUh]b['hc`UVW]XYbhU`mWcdm]b['Zfca `U`gci f\W' k]h\ci hUW_bck `YX[Ya Ybh'

IBGK [fcidgdu[]uf]ga]bhch\YZc``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'

±DUddfcdf]UhY`dUfUd\fUg]b[.'W\Ub[]b['U'ZYk'kcfXg'UbX'd\fUgYg'k\]`Y`acghmfYhJ]b]b['h\Y`cf][]bU`ghfi WhifY`UbX`]bZcfaUh]cb`k]h\ci hUW_bck`YX[YaYbh'H\]g'U`gc'Udd`]Yg`]b'dfYgYbhUh]cbg'k\YfY`gcaYcbYdUfUd\fUgYg`Ubch\Yf'g`]XYUg`cf'kcfXg'k]h\ci hWfYX]h''±iU`gc'Udd`]Yg`hc'd]YW]b['hc[Yh\Yf'ei chYg'UbXdUfUd\fUgYg`]bhc'U'bYk'k\c`Yžk]h\ci hfYZ/fYbW]b['UbX'U'ghi XYbh'g`ck b'UbU`mg]g`hc'Vf]b['h\Y`aUhYf]U`hc[Yh\Yf''

7 c``i g]cb. 'k cf_]b['k]h\ 'ch\ Yfg'Vi h'dUgg]b['c\Z'h\ Y 'k cf_'Ug'U'dYfgcb'g']b\X]j]\Xi U``k cf_"'7 c``i g]cb'U`gc]b\Wi XYg'dfcj]\X]b['mci f'k cf_'hc'Ubch\ Yf'ghi XYbh\ VYZcfY'h\ Y 'Xi Y 'XUhYzcf'Zcf'h\ Y' di fdcgY'cZh\ Ya d`U[]\Uf]g]b['Uh\Ubmh]a Yz'dUm]b['Ubch\ Yf'dYfgcb'hc'dYfZcfa 'Ub'U\WUXYa]\Wh\Ug_z'ghYU']b['cf'U\\ello i]f]b[Ubch\ Yf'dYfgcb'g' U\WUXYa]\Wk cf_'Ub\X'\\ello dm]b[']hz'c\ZYf]b['hc'\\ello a d`YhY'Ubch\ Yf'dYfgcb'g' k cf_'cf'gYY_]b[d\una Ybh\Zcf'\\ello a d`Yh\beta d`

±bUddfcdf]UhY`W]hUh]cb.`7]h]b[ˈgci fW/gˈk \]WX`\Uj Y`bchVYYb`fYUXžk]h\ci hUW_bck`YX[]b[ˈh\Y`″gYWcbXUfm″gci fW/Zfca k \]WX`_bck`YX[Y`cZh\Ya`\Ug'VYYb`cVhU]bYX"

8 i d`]\WUh]cb`ff`gY`Zld`U[]\Uf]ga "Ł`gi Va]\h]b[`mci f`ck b`k cf_ž]b`k \c`Y`cf`]b`dUfhžk \YfY`]h`\Ug`dfYj]ci g`m VYYb`dfYdUfYX`cf`gi Va]\hYX`Zcf`Ubch\Yf`UqqYqqa Ybhcf\Wci fgY`UhI_BGK_`cf`Ubch\Yf`i b]\Yfq]\m"

7 cffYWhfYZYfYbWb[dfUWhWyg.

• VYHYfa UbU[Ymcifh]a Y

7ci fgY GWX YXi `Y

<u>J]Yk "WUgg"hja YHUV"Y</u>

H]a YHJV`Y

8 UhY	HmdY	7 cbhYbh
K YY_'%'&*': YVfi Ufm!'(A UfWX	@YWn fY	±blfcXiWf]cbihc; ch\]W7i`hifYg
K YY_'&.')	@YWhifY	< cfUVV K U`dc`YžFZW5Sef′WaXA fc6` fa
A UfVX	GYa]bUf	±blfcXiVMjcbihcih\Yi; ch\]W
K VWY_'%:%&:'A 5fMX''Ž'%*	@YWh fY	5bb F UXW]ZZY ž F ZW? kefWd(We a XG Va ⁄bZa
A UfWX	GYa]bUf	< cfUVW^K U`dc`Yž'H\Y^7 UghY^cZC lfUbhc
		₲ⅉ\$Y` 7ÈUd`] bžf₲dY Wf Yg`cZ@Uk`}b`P%W5&efW&&Uk`