

6Yf`]b ZY]Yfh A]bYfj U < UgY i bX B]_]hU J c`cX]b 9i fcdUa Y]ghYf]a 'DUUf`Ui Z°

A]bYfj U'<UgYž'9i fcdUa Y]ghYf]b']a '9]g_i bgh`Ui Zž'gdf]W\h ØVYf']\fYb'9fZc`[ž'HfU]b]b['i bX'X]Y'C`ma d]UVYk YfVi b[6Yf`]bg"



<c\YbgWX\Ob\Ui gYbž'8Yi hgWX\UbX'!A]bYfj U'< UgYz'Y]bY
&)!^A\f][Y'9]g_i bgh`Ai ZYf]b'Ui g'6Yf`]bz'\Uh']b'X]YgYf'GU]gcb'a]h
]\fYa 'DUfhbYf'B]_]hU'Jc`cX]b'VYa Yf_Ybgk YfhY'9fZc`[Y'Yfn]Y`h''
BUWX'XYa'; Yk]bb'XYg'9i fcdUa Y]ghYfh]hY`g']a 'DUUf`Ui Z'\Uh'XUg
8i c'Ui WX'VY]'XYf'K Y`ha Y]ghYfgWXUZh']b'AcbhfYU`'Vf]``]Yfhz'k c'g]Y
X]Y'YfghY'XYi hgWXY'K A!AYXU]`Y']a 'DUUf`Ui Z'gY]h'&\$%, 'Yff]b[Yb_cbbhYb'''< UgY'Yfn]Y`hY'XUVY]'a]h'&%\$z'(\$'Di b_hYb'Y]bY
dYfgOb`]WXY'6YghY]ghi b['''8Ug'; c'XaYXU]``Y'[]b['Ub'X]Y'?UbUX]Yf
8YUbbU'GhY``Uhc!8i XY_'i bX'AUI]aY'8YgWXUadgz'k A\fYbX'XUg
G]`VYf'Ub'X]Y'&JdUbYf'F]_i 'A]i fU'i bX'Fmi]WX]'?]\UfU'j Yf[YVYbki fXY'''< UgY'i bX'Jc`cX]b'a@ggYb'YXcWX'kY]hYf\]b'Ub']\fYf
?cbghUbn'UfVY]hYbz'i a']\fY'@Y]ghi b['Ui Z']bhYfbUh]cbU`Ya'DUf_Yhh
ni 'ghY][Yfbz'k]Y'X]Y'9]g_i bgh`Ai ZYf]b'gY'VghVYhcbh''8]Y'VY]XYb</pre>

 $\label{thm:condition} $$ \| VYfY \|_{hg'}; \ fUbX!Df] \| !9j Ybhg' \|_{b''} \| 9gdcc'' bX''CgU_U''gck \|_{Y''} XUg ; \ fUbX!Df] \| !: \|_{bU'Y'} \|_{b''} \|_{c''} \| Yk cbbYb\check{z}'k Ug' \|_{Y''} \|_{hYh''} \|_{b''} \|_{b''} \| Yf'' \|_{hYh''} \|_{b''} \| fcgdcfh'' \|_{C''} \|_{L^{\infty}} \|$

< UgY ii bX J c`cX]b dZY[Yb Y]bY Yb[Y 5fVY]hgVYn]Y\i b[žX]Y j cb
Y]bYf A]gW\i b['Ui g'dfc ZYgg]cbY``Yf DUfhbYfgW\ UZhii bX
: fYi bXgW\ UZh [YdfA[hi]gh" 8]YgY ; fi bX`U[Y 'VUg]Yfh'Ui Z'J YfhfUi Ybž
k Ug']a '@Y]ghi b[ggdcfh'VYgcbXYfg'k]W\h][']gh" \= fY
Ni gUa a YbUfVY]h'k Uf'UbZUb[g'b]W\hY]bZUW\žXU'gdfUW\`]W\Y
6Uff]YfYb'ØVYfk i bXYb'k YfXYb'a i gghYbžX]Yg'ghY``h'YXcW\'_Y]bYb
bYbbYbgk YfhYb'<]bXYfi b[g[fi bX'ZØf'X]Y'VY]XYb'XUf"' < UgY
VY[Ubb']\fY'9]g_i bgh`Ui Z_Uff]YfY']a '5`hYf'j cb'ZØbZ'\J\fYbž
bUW\XYa 'g]Y']\fY'9'hYfb'ØVYfnYi [h'\UhhYž'g]Y'ni Y]bYa
DfcVYhfU]b]b['ni 'VY[`Y]hYb"'GY]h']\fYa 'K YW\gY`ni a 'DUUf`Ui ZYbž
XUg'g]Y']a '5`hYf'j cb'%('cXYf'%) '\J\fYb'k U[hYž'hfU]b]Yfh'g]Y'a]h
J c`cX]b'i bX'\Uh'gY]h\Yf'Y]bY'VYa Yf_Ybgk YfhY'?Uff]YfY'\]b[Y'Y[h'
VYf]W\hYh'fV\&("</pre>

HfU]b]b[gVYX]b[ib[YbibX'@YVYbggh]`

8]Y'VY]XYb'Gdcfh`Yf'hfU]b]YfYb']a 'GdcfhZcfi a ']b
<c\YbgW\\Ob\Ui gYb\z'k Y'W\Yg'YI nY``YbhY'HfU]b]b[gVYX]b[i b[Yb
V]YhYh"'9]b'hmd]gW\Yf'HfU]b]b[ghU['i a ZUggh'nk Y]'6`\OW_Y'a]h
]bg[YgUa h'j]Yf'V]g'gYW\g'Ghi bXYb']bhYbg]j Yb', VYbg"'<UgY'Yf\\A`h
U`g'Gdcfhgc`XUh]b'Y]b'a cbUh`]W\Yg'; Y\U'h'j cb'XYf'6i bXYgk Y\fz
k Ug']\f'X]Y'Z]bUbn]Y``Yb'A]hhY`'g]W\Yfhzii a 'j c``i bX'[Ubn']\fYf
@Y]XYbgW\UZh'bUW\ni [Y\Yb"8]Y'C`ma d]gW\Yb'Gd]Y`Y'&\&*']b
#U`]Yb'ghY``Yb'Z\Of'g]Y'i bX']\fYb'DUfhbYf'Y]bY'k]W\h][Y
<YfUi gZcfXYfi b['XUf"'Jc`cX]b'VYb\Oh][h'YXcW\'Y]bYb'XYi hgW\Yb
DUgg\z'i a 'Z\Of'8 Yi hgW\'UbX'UbhfYhYb'ni '_ObbYb"'9]b'@Y\fYf'k]fX
]\b'VY]'XYf'8 Yi hgW\\df\Z\z b['i bhYfgh\OhnYb\z'i a 'X]YgYg'N]Y``ni
YffY]W\Yb'\]bni Z\Off h'9i fcqdcfh"

Ni gàhn`]W\ni ']\fYf'gdcfh`]W\Yb'?Uff]YfY'g]Y\h'<UgY'X]Y
VYj cfghY\YbXYb'C`ma d]gW\Yb'Gd]Y`Y'U`g'Y]bY'[fc»Ufh][Y
; Y`Y[Yb\Y]h'ZØf'XYb'Gdcfh']b'8Yi hgW\`UbX"'G]Y'VYhcbhž'XUgg
gc`W\Y'; fc»j YfUbghU`hi b[Yb'\Dj Ygh]h]cbYb']b'XYb'Gdcfh'a]h'g]W\
Vf]b[Yb'_ObbYbž'k Ug'VYqcbXYfg'k]W\h]['ZØf'X]Y': OfXYfi b['j cb

HU`YbhYb`]gh"\8]Yg`_ObbhY`Ui\W\`X]Y`Ni_i\b\Zh`XYg`9]g_i\bgh`Ui\Zg`]a\@UbX`bUW\\U`h][\`VYY]bZi\ggYb`i\bX`?]bXYf`Yfa\i\h][\Yb\ZgY\Vgh`]b\X]YgYb`ZUgn]b]YfYbXYb`Gdcfh`Y]bni\hUi\W\Yb`\VYf]\W\\hY\hY\fVV&(\"

GdcfhdgmWXc`c[]Y`]a '9]g_i bgh`Ui Z

: Øfini _ØbZh][Y 5h\ `YhYb k]fX X]Y 'gdcfhdgmWk c`c[]gWk Y '6YhfYi i b[]a '9]g_i bgh`Ui ZYb'j cb'[fc» Yf'6YXYi hi b['gY]b"'9]b'bYi Yg FU\a Yb_cbnYdhž'XUg'Xi fWk 'XUg'6i bXYg]bgh]hi h'ZØf Gdcfhk]ggYbgWk UZhYb'[YZÒfXYfh`k i fXYž'ghfYVh'Ubž'X]Y 'a YbhU`Y GhÀf_Y'XYf'Gdcfh`Yf'ni 'i bhYfghØhnYb"'9g'VYfØW_g]Wk h][h gdYn]Z]gWk Y'6YXØfZb]ggY'j cb'5h\ `YhYb'i bX'HfU]bYfb'ØVYf j YfgWk]YXYbY'5`hYfg!'i bX'9bhk]W_`i b[gghi ZYb'\]bk Y["'8]Y gdcfhdgmWk c`c[]gWk Y'6YhfYi i b['gc``'? UXYfUh\ `YhYb'Yfa Ò[`]Wk Ybž g]Wk 'cdh]a U``Ui Z'K Yhh_Àa dZY'j cfni VYfY]hYb'i bX']\f'j c``Yg DchYbn]U``UVni fi ZYb'VYf]Wk hYh'X]Y'9]g`Ui Z!I b]cb"

8]Y '9fZc`[Y'j cb' < UgY'i bX'J c`cX]b'g]bX'b]W\h'bi f'Y]b'NY]W\Yb]\fYf'\UfhYb'5fVY]h'i bX' <]b[UVYž'gcbXYfb'Ui W\'Y]b' <]bk Y]g'Ui ZX]Y'dcg]h]j Yb'9bhk]W_`i b[Yb']a '9]g_i bgh`Ui Z']b'8Yi hgW\`UbX"'9gV`Y]Vh'gdUbbYbXž'k Y`W\Y', VYffUgW\i b[Yb'X]Y'VY]XYb9]g_i bgh`Ài ZYf']b'Ni _i bZh'bcW\'VYfY]h\U`hYb'k YfXYb"

8YhU]`g	
Cfh	<c\ybgw\`ob\uigybž'8yihgw\`ubx< th=""></c\ybgw\`ob\uigybž'8yihgw\`ubx<>
EiY``Yb	• k k k "fVV&("XY
	k k k "Yi fcgdcfh"XY
	k k k "Y]g`Ui Z!i b]cb"XY

6 Ygi W Yb G]Y i bg Ui Z b!U["bYh