

# 

5a 'A cbhU[ ž'[ Y[ Yb'%+.%) 'I \fž'YfY][ bYhY'g]W 'Ui Z'XYf'?'( %\* \$`]b GW Uhh\Ui gYb'Y]b'gW k YfYf'J Yf\_Y\fgi bZU``ž'VY]'XYa 'nk Y]'D\_k VYhY]`][ h'k UfYb"'8]Y'\*'!'À\f][ Y': U\fYf]b'Y]bYg'DYi [ Ych'j Yf`cf']b Y]bYf'FYW hg\_i fj Y'X]Y'?cbhfc``Y'ØVYf']\f': U\fnYi [ 'i bX'[ Yf]Yh'Ui Z X]Y'; Y[ YbZU\fVU\b"'8cfh'\_Ua 'Yg'ni 'Y]bYf'ZfcbhU`'Ui ZhfYhYbXYb?c``]g]cb'a ]h'Y]bYf'\*)!'À\f][ Yb': U\fYf]b'Y]bYg': cfXž'X]Y cfXbi b[ g[ Ya À» ']b'X]Y'Ybh[ Y[ Yb[ YgYhnhY'F]W hi b[ 'i bhYfk Y[ g k Uf"

8]Y'K i Wkh'XYg'5i ZdfU``g'k Uf'Ybcfa ii bX'ZØ\fhY'XUni ž'XUgg'XYf: cfX'Ui Z'Y]bYb'; fØbghfY]ZYb'[YgWk`Yi XYfh'k i fXY"'6Y]XY: U\fYf]bbYb'k i fXYb'bUWk'XYa 'J cfZU``']bg'?fUb\_Yb\Ui g'[YVfUWkh'' 8]Y'I bZU``j Yfi fgUWkYf]b'nc['g]Wk'gWkkYfY'JYf`Yhni b[Yb'ni žkÀ\fYbX'X]Y': cfX!: U\fYf]b'a ]h'`Y]WkhYb'JYf`Yhni b[Yb'XUj cb\_Ua" 8]Y'VY]XYb'b]Wkh'a Y\f'ZU\fVYfY]hYb': U\fnYi [Y'a i gghYb UV[YgWk`Yddh'kYfXYbž'i bX'X]Y'GWkUXYbg\Ò\Y'k]fX'Ui Z'Yhk U'\$"\$\$\$'9i fc'[YgWkÀhnh"

#### 9fa ]hh`i b[Yb i bX I fgUWXYbZcfgWXi b[

5\_hi Y````Ui ZYb`X]Y`9fa ]hh`i b[Yb`ni `XYb`[YbUi Yb`l bZU``i fgUW\Ybžk Y`W\Y'j ca `JYf\_Y\fgX]Ybgh'<Y]XY`VYf[`[Y`Y]hYh`k YfXYb"`9g`k]fX j Yfa i hYhž'XUgg`X]Y`l bZU``j Yfi fgUW\Yf]b`a Ò[`]W\Yfk Y]gY`i bhYf XYa `9]bZi gg`j cb`A YX]\_Ua YbhYb`ghUbXž'k Yg\U`V`Y]bY`6`i hdfcVY Ybhbca a Yb`k i fXYž'i a `X]YgY`H\Ycf]Y`ni `ØVYfdfØZYb"`8]YgYg

### $G]WXYfY]hga U bU a Yb']a 'GhfU Ybj Yf_YYf$

I bZÀ``Y`k]Y`X]YgYf'j YfXYi h`]W\Ybž'k]Y`k]W\h][ 'Yg']ghžg]W\`XYf
a Ò[`]W\Yb'; YZU\fYb']a 'GhfU» Ybj Yf\_Y\f'VYk i ggh'ni 'gY]b"'8]Y
?ca V]bUh]cb'Ui g'b]W\h'j cfgW\f]Zhga À»][ Ya ': U\fj Yf\U`hYb'i bX
a Ò[`]W\Yfk Y]gY`VYY]bhfÀW\h][ hYf': U\fhØW\h][ \_Y]h'\_Ubb'ZUhU`Y
: c`[ Yb'\UVYb"'=b'X]YgYa ': U```\_Ua 'Yg'Ui Z[ fi bX'Y]bYg': U\fZY\`Yfg
i bX'a Ò[`]W\Yfk Y]gY'Y]bYf'[ Ygi bX\Y]h`]W\Yb'6YY]bhfÀW\h][ i b[ 'ni
Y]bYa 'gW\k YfYb'I bZU``ž'XYf'bi f'Xi fW\XUg'; `ØW\_XYf'VY]XYb
6YhY]`][ hYb'b]W\h'bcW\'gW\`]a a Yf'Ui g[ ]b[ "

 $8 ]Y `Dc`]nY] `f \grave{A}h`XYb`JYf_Y \ fghY] `bY \ a Yfbž`VYgcbXYfg`]b`?ifjYbibX`VY] `VYgcbXYfYb`GhfU \ YbVYX]b[ib[Yb`ghYhg`VYgcbXYfgj]cfg]WXh][ `ni `ZU \ fYb''5i WX`X]Y`9]bbU \ a Y`jcb`AYX]_Ua YbhYbgc``hY`]a `< ]bV`]W_`Ui Z`XYfYb`5i gk]f_ib[Yb`Ui Z`X]Y: U\fhUi [`]WX_Y]h`ghYhg`_f]h]gWX`ØVYfdfØZh`kYfXYb'' JYf_Y \fgg]WXYf\Y]h`]ghY]b`; Ya Y]bgWXUZhgdfc`Y_hž`VY]`XYa `YXYf9]bnY`bY`gY]bYb`6Y]hfU[``Y]ghYb`_Ubb''$ 

a `Ni gUa a Yb\Ub[ 'a ]h'XYa `J cfZU```\_ÒbbhY 'a Ub 'Ui W\ 'X]Y Bchk YbX][ \_Y]h'j cb '5i Z\_`Àfi b[ g\_Ua dU[ bYb ']b '6YhfUW\h'n]Y\Ybž X]Y 'ØVYf'X]Y 'F]g]\_Yb 'XYg': U\fYbg'i bhYf'XYa '9]bZi gg'j cb A YX]\_Ua YbhYb ']bZcfa ]YfYb" 'Gc`W\Y' =b]h]Uh]j Yb '\_ObbhYb 'XUni VY]hfU[ Ybž'XUg'6Yk i gghgY]b 'ZØf'X]Y 'j YfgW\]YXYbYb 'F]g]\_Yb ']a GhfU» Ybj Yf\_Y\f'ni 'gW\ÀfZYb'i bX'a O[`]W\Yfk Y]gY'À\b`]W\Y J cfZÀ``Y']b 'XYf'Ni \_i bZh'ni 'j Yf\]bXYfb"

## I fgUWX Yb j cb J Yf\_Y\fgi bZÀ``Yb

JYf\_Y\fgi bZÀ``Y`k]Y`XYf`]b`GW\Uhh\Ui gYb`[YgW\Y\Yb`\Ài Z][`Ui g
j YfgW\]YXYbYb; fØbXYb"8Uni 'nÀ\`Yb`hYW\b]gW\Yg`JYfgU[Ybž
a YbgW\`]W\Yg`JYfgU[Yb`i bX`9]bZØggY`j cb`Ui »Ybž'k]Y
VY]gd]Y`gk Y]gY`K]hhYfi b[gVYX]b[i b[Yb"'\dangle X]YgYa 'gdYn]Y``Yb`: U``
k]fX`j Yfa i hYhžXUgg`X]Y`I bZU``j Yfi fgUW\Yf]b`a Ò[`]W\Yfk Y]gY
i bhYf`XYa '9]bZi gg`j cb`AYX]\_Ua YbhYb`ghUbXž'k Ug`X]Y
FYU\_h]cbgZÀ\][\_Y]h`VYY]bhfÀW\h][Yb`\_ÒbbhY"'@Ui h`XYf`8Yi hgW\Yb
; YgY``gW\UZh`ZØf`JYf\_Y\fgdgmW\c`c[]Y`gd]Y`Yb`gc`W\Y': U\_hcfYb
Y]bY`VYXYi hYbXY`Fc``Y`VY]`XYf`I bZU``ghUh]gh]\_"

I bhYfgi WXi b[Yb'nY][Ybž'XUgg': U\fYf'i bhYf

A YX]\_Ua YbhYbY]bZi gg'cZh'GWXk]Yf][\_Y]hYb'\UVYbž']\fY

; YgWXk]bX][\_Y]h'i bX'XYb'5VghUbX'ni 'UbXYfYb': U\fnYi [Yb

Ub[Ya YggYb'Y]bni gWXÀhnYb"'9g']gh'YVYbZU``g'VY\_Ubbhž'XUgg'j]Y`Y

A YX]\_Ua YbhY'BYVYbk]f\_i b[Yb'k]Y'GWX`ÀZf][\_Y]h'cXYf

j Yfa ]bXYfhY'?cbnYbhfUh]cb'\Yfj cffi ZYb'\_ObbYb"'@Ui h'Y]bYf

I a ZfU[Y'XYg'5857ž'[YVYb'ØVYf'&\$'i 'XYf': U\fYf'Ubž'XUgg'g]Y

g]WX'VY]a :: U\fYb'i bg]WXYf'ZØ\`Ybž'k Ybb'g]Y'A YX]\_Ua YbhY

Y]bbY\a Yb"

### FY`Yj UbhY'GhUh]gh]\_Yb'ni 'JYf\_Y\fgi bZÀ``Yb

 $\label{thm:linear:continuous} $$JYf_Y\setminus fgi\ bZA``YghY``Yb'bUWA`k]Y'j\ cf'Y]b'Yf\YV`]WYg'F]g]_c'ZØf $$X]Y'OZZYbh']WXYG]WXYf\Y]h'XUf''=a \div J\f'&$&&'k i fXYb']b $$Yi hgWA`UbX'ØVYf'&ž) 'A]``]cbYb'JYf_Y\fgi bZA``Y'fY[]ghf]Yfhž'j cb $$YbYb'a Y\f'U`g'' $$"$$$'ni 'JYf`Yhni b[Yb'ZØ\fhYb'''9]bY'U_hi Y``Y $$hUh]gh]_'XYg'GhUh]gh]gWXYb'6i bXYgUa hYg'nY][hž'XUgg'Yhk U''&$$'AYbgWXYb'VY]'JYf_Y\fgi bZA``Yb'i a g'@YVYb'_Ua Ybž'k Ug']a JYf[`Y]WX'ni 'XYb'Jcf'U\fYb'Y]bYb'FØW_[Ub['XUfghY``hž'YXcWX kY]hYf\]b'U`Ufa ]YfYbX']gh''$ 

 $8 ]Y'5`hYfg[fiddY'XYf'*\$!'V]g'*-!\mathring{A}\f][Yb']gh'VYgcbXYfg'VYhfcZZYbžXU'Å`hYfY': U\fYf'cZha U`g'`Ub[gUa Yf'fYU[]YfYb'ibX'jYfgW&]YXYbY [YgibX\Y]h`]W\Y'9]bgW\fÅb_ib[Yb'UiZkY]gYb'''9]bY'IbhYfgiW\ib[nif'JYf_Y\fgg]W\Yf\Y]h'\Uh'Yf[YVYbž'XUgg'&)'i''U``Yf'IbZU``cdZYfUiZ'@UbXghfU\"Yb']b'Y]bYf'Å\b`]W\Yb'5`hYfg[fiddY'ZU``Ybž'kUg'X]Y$ 

;  $YZU\ fYb X]YgYf J Yf Y fgg]hi Uh]cb i bhYfghfY]WXh"$ 

±bg[YgUa h']gh'Yg'k]W\h][žX]Y'; fØbXY'ZØf'gc`W\Y'I bZÀ``Yž'k]Y'Yhk U 5V`Yb\_i b[ž'5`\_c\c`!'cXYf'8fc[Yb\_cbgi a ž'gck]Y'X]Y'Fc``Y'j cb A YX]\_Ua YbhYb'ni 'VYhfUW\hYbž'i a 'A U» bU\a Yb'ni f'JYfVYggYfi b[XYf'JYf\_Y\fgg]W\Yf\Y]h'ni 'Ybhk]W\_Y`b"

8 YhU]`g

6Ygi WXYb G]Y i bg Ui Z b!U[ "XY