

SRAP5001

Dc`]Wm5bU`mg]g

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

7 ci fgY Cj Yfj]Yk

GHJZZ:7cbHJWh:8YHJ]`g`

'7cbj Ybcfg'

| B Ua Y | 9a U]` | 5j U]`UV]`] m | @cWUh]cb | D\cbY |
|------------|-----------------------------|----------------------|--------------------------|-----------|
| GU``m6U_Yf | gU``m"VU_Yf4 i bgk "YXi "Ui | 6m'Uddc]bha Ybh | A cfj Yb 6fck bž ; %* | -',)\$*,* |

GWXcc`7cbHJWhi±bZcfa Uhjcb

GWXcc``cZGcWJU``GWJYbWYg

Fcca '%) -

A cfj Yb 6fck b 7 &\$

Ya U]`. 'gcgg4 i bgk "YXi "Ui

d\cbY. '\$&'-',) '% \$+

7ci fgY 8YHJ] g

7 fYX]hDc]bhg * *

Gi a a UfmcZh\Y 7ci fgY

 $H\ [g'Wci\ fgY']g'Ub'UWUXYa\ [W]bei\]fmi]bhc'dfUW]WY'z'UbX']hXfUk\ g'cb'Vch\ 'UWUXYa\ [WUbX'dfUW]WU' _bck\ 'YX[Y'']$

H\Y'_Ym`YUfb]b['cVYWij Y'cZh\Y'Wci fgY']g'hc'YI dUbX'h\Y'UV]`]hmcZghi XYbhg'hc'a cV]`]gY'UWUXYa]W _bck `YX[Y'hc'Yb\UbW'h\Y]f'i bXYfgHubX]b['cZdc`]WmdfcWrggYg"'Ghi XYbhg'Wca Y'hc'h\]g'Wci fgY'Zfca 'U X]j Yfg]hmcZVUW_[fci bXgž']b'hYfa g'cZYXi WUh]cbž'df]cf'YI dYf]YbWr'UbX'W ffYbhcWW dUh]cbž'UbX'gc'h\Ym YbWci bhYf']hX]ZZYfYbhmž'UbX'X]ZZYfYbh`YUfb]b['ghfUhY[]Yg'UfY'Uddfcdf]UhY'''K \UhYj YfmcbY'bYYXg']g'hc'VY UV'Y'Vch\'hc']bhYffc[UhY'h\Y'UWUXYa]W']hYfUhi fY'UbX'hc']bhYffc[UhY'dc']WmdfUWiW'"

7 ci fgY @YUfb]b[Ci hMca Yg

- %" I bXYfgHJbX'U'fUb[Y'cZh\YcfYh]WJ\`WcbWYdhg'cZdc`]WmUbX'h\Y'dc`]WmdfcWYgg
- &" 5dd`mdc`]Wmih\YcfmUg'U'lcc``]b'h\Y'UbU`mg]g'cZdc`]Wmjggi Yg
- ' "8Ya cbgffUlY XYj Y`cdYX`]a dfcj YX'dfYgYbfUljcb 'UbX'UbU`mtj\WJ``g_]``g
- ("8]gd`UmU`VfcUXYf`i bXYfgHJbX]b[`cZh\Y`cf[Ub]gUh]cbg`UbX`XmbUa]Wg`h\Uhgi ffci bX`h\Y`dc`]Wh XYj Y`cda Ybh'UbX`dc`]WhXYW]g]cb!a U_]b[`dfcWYggYg

HYUWX]b['GhfUhY[]Yq'

FUhlcbU`Y.

 $H\Y''_Ym'YUfb]b[\ 'cV'YWf]\ Y'cZh\Y'Wci\ fgY']g'hc'YI\ dUbX'h\Y'UV]']hm'cZghi\ XYbhg'hc'a\ cV]']gY'UWUXYa\]W \\ _bck\ 'YX[\ Y'hc'Yb\UbW'h\Y]f'i\ bXYfghUbX]b[\ 'cZdc']WhidfcWfggYg''$

Ghi XYbhgʻWca Yʻhcʻh\]gʻWci fgYʻZfca ʻUʻX]j Yfg]hmcZVUW_[fci bXgžʻ]bʻhYfa gʻcZYXi WUh]cbžʻdf]cfʻYl dYf]YbWY UbXʻW ffYbhcVWV dUh]cbžʻUbXʻgcʻh\YmYbWci bhYfʻ]hX]ZYfYbhmžʻUbXʻX]ZYfYbh`YUfb]b[ˈghfUhY[]YgʻUfY Uddfcdf]UhY"ʻK\UhYj YfmcbYʻbYYXgʻ]gʻhcʻVYʻUV`YʻVch\ʻhcʻ]bhYffc[UhYʻh\YʻUWUXYa]Wʻ]hYfUhi fYʻUbXʻhc]bhYffc[UhYʻdc`]WmdfUWJWY"

HYUW]b[ghfuh / [] / g.

 $H\Y'Wci fgY'Vf]b[g'UWUXYa]W'_bck `YX[Y'hc'VYUf'cb'dfUWf]WYz'UbX'WU``g'cb'gh XYbhg'hc'a UghYf'h\Y UbU`mf]WU``a UhYf]U``]b'h\Y'UWUXYa]W']hYfUh fYz'UbX'hc Vf]b[']hhc'VYUf'cb'h\Y]f'ck b'Yl dYf]YbW''UbX'h\Y$

YI dYf]YbWY cZch\Yfgž'Ug fYdcfhYX]b h\Y ``]hYfUh fY 'UbX]b 'WUgg 'X]gW gg]cb"

 $\label{thm:linear_continuous_co$

H\Y`WUgg`\Ug`Y`Ya Ybhg`cZVch\``YWh f]b[``UbX`X]gW gg]cbž`]b`j Ufm]b[``Wta V]bUh]cbg"``Gca Yh]a Yg`hUg_g`k]`` VY`[]j Yb`hc`ga U```[fci dgž`Zcf`X]gW gg]cb`Y]h\Yf`]b`WUgg`cf`ci hg]XY`cZ]hž`UbX`fYdcfh]b[`VUW_"```H\]g`k]```WU``cb`ftcf`XYj Y`cdŁ'ghi XYbhgfig_]``g`cZk cf_]b[`Wt``YWh]j Y`mž'UbX`cZYZZYWh]j Y`fYdcfh]b[`"`H\Y`W\U``Yb[Y`Zcf ghi XYbhg`k]```VY`hc`WtbhYl hi U`]gY`h\Y`X]gW gg]cb`gc`h\Uhh\Y`h\YcfYh]WU``a UhYf]U``fY`UhYg`hc`h\Y]f dfcZYgg]cbU``UbX#cf`dYfgcbU``WtbhYl hi

5ggYgga Ybh

Gi Va]gg]cb cZDYYf 5 ggYgga YbhGWcfYg

Mci 'a i ghgi Va]hmci 'dYYf'UggYgga YbhgWcfYg'cb'h\Y'gUa Y'XUmcZmci f'dfYgYbhUh]cb"'5```a Ya VYfg'cZh\Y [fci d'a i ghgi Va]hU'dYYf'UggYgga YbhgWcfY'g\YYh''H\Y'dYYf'UggYgga YbhgWcfY'g\YYhg\ci 'X'VY gi Va]hhYX']b'U'gYU'YX'Ybj Y`cdY'cf'Zc'XYX'cj Yf'gc'h\Uhmci f'gWcfYg'UfY'bchj]g]V'Y'hc'ch\Yfg"

FYh fb cZUgg][ba Ybhg

9 YWfcb]Wgi Va]gg]cbg'k]``VY'fYh fbYX'j]U'h\Y'Hi fb‡b'dcfhU``cb'A ccX`Yžcf'A ccX`Y`5gg][ba Ybhk]h\Y`YWfcb]WZYYXVUW_k]h\]b'h\fYY'k YY_q'cZqi Va]gg]cb"

: YYXVUW_cb Ugg][ba Ybhg

| 5GG9GGA 9BH H5G? | 998657? A 97<5B €A | : 998657? 85H9 |
|----------------------|---------------------------|----------------------|
| fciddygybhuhcbg | C b`]bY | K]h\]b cbY k YY_ |
| K f]HYb'UggYgga Ybhg | 7 ca a YbhgʻUbXʻa Uf_gʻcb | K]h\]b"h\fYY"k YY_g |
| | Hi fb]h]b | |

5ggYgga Ybh'HUg_g'

| 5ggYgga Ybh'hJg_ | K Y][\h | 8i Y'8UHY | Gh XYbh@YUfb]b[Ci hWca Yg 5ggYggYX |
|--------------------------|---------|---|--|
| Dc`]Wm7UgY'Gh Xm'F Ydcfh | ') | &&#\$' #&\$%-'%%) - 'DA</td><td>%ž&ž(</td></tr><tr><td>Dc`]Wm7UgY'GHXm DfYgYbHJHjcb'</td><td>%) ၊</td><td>&, #\$' #&\$%- '%%) - 'DA</td><td>%ž&Ž Ž(</td></tr><tr><td>Dc`]Wm6f]YZ]b['</td><td>) \$1</td><td>\$%\$)#&\$% '%%) - 'DA</td><td>%ž&ž(</td></tr></tbody></table> | |

5ggYgga Ybh8YHJ]`g

5ggYgga Ybh% Dc`]Wm7UgY Gh Xm F Ydcfh

GHJfh'XUhY.

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

8 YHJ]`g. '♣bX]j]Xi U``k f]HYb`fYdcfhfk]h\`fYgdYWhc`Dc`]Wm7 UgY`Gh Xm`DfYgYbHJh]cbŁž%) \$\$`k cfXg"Gh XYbhg k]``fYWY]j Y`k f]HYb`ZYYXVUW_UbX`U`a Uf_YX`fi Vf]Wk]h\]b`HYb`XUmg`cZgi Va]gg]cb"`H\Y`fi Vf]Wk]```VY Uj U]`UV`Y`Uhh\Y`gHJfhcZgYa YgHYf`hc`U``ck 'gh XYbhg`hc`k cf_`hck UfXg`WYJf`mWca a i b]\WJhYX`gHJbXJfXg"

5qqYqqa Ybh& Dc`|Wm7UqYGh Xm DfYqYbhUh|cb

GHUfh) GHUfhXUHY.

@Yb[h\."%\$"a]bihYg"dYf"[fcid"aUl

8 YHJ]`g. ; fci d'dfYgYbHJh]cbža UI]a i a '%\$`a]bi hYg"Ghi XYbhg`k]``fYWY]j Y`k f]hHYb`ZYYXVUW_'UbX`U`a Uf_YX fi Vf]Wk]h\]b`hYb`XUmg`cZgi Va]gg]cb"'H\Y`fi Vf]Wk]``VY`Uj U]`UV`Y`Uhh\Y`gHJfhcZgYa YghYf`hc`U``ck 'ghi XYbhg hc`k cf_'hck UfXg`WYUf`mWca a i b]\WJhYX`gHJbXUfXg"

Gi Va]gg]cb bch/g.; fci d df/gYbhUh]cb g`]XYg g\ci `X VY gi Va]hh/X Vm &*h\ `A UfW\ f) da Ł

 $\label{eq:higher_high_problem} \textbf{Hi fb]h}b\dot{g}\textbf{y}\textbf{Yhh}b\dot{b}.[~.~H\]g^]g^bchU^Hi~fb]hb^Ugg][~ba~Ybh$

5ggYgga Ybh' . Dc`]Wm6f]YZ]b[

FYgci fWyg

DfYgWf]VYX F Ygci fWYg

7 cfY 'hYI h

7 c`YVUMX ž'< "`? "`f&\$\$- Ł"`

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"'=hWJb'hU_Y`a Ubm Zcfa gžZfca `XY`]VYfUhY`W\YUh]b['hc`UWW]XYbhU`mWcdm]b['Zfca `U`gci fWY'k]h\ci hUW_bck `YX[Ya Ybh'

IBGK [fcidg'd'U[]Uf]ga]bhc'h\Y'Zc``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'dfcYWgž'Ug'k Y``'Ug dfYgYbhUh]cbg'k\YfY'gca YcbY'dfYgYbhg'Ubch\Yf'g']XYUg'cf'k cfXg'k]h\ci h'WfYX]h'

♣Uddfcdf]UhY 'dUfUd\fUg]b[...7\Ub[]b[...7\Ub[]b[...7\Ub[]b[...7\Ub[]b[...7\Ub[]b]b[...7\Ub[

7 c``i g]cb.'k cf_jb['k]h\ch\Yfg'Vi hdUgg]b['cZZh\Y'k cf_'Ug'U'dYfgcb'g']bX]j]Xi U``k cf_"'7 c``i g]cb'U`gc]bWi XYg'dfcj]X]b['mci f'k cf_'hc'Ubch\Yf'ghi XYbhVYZcfY'h\Y'Xi Y'XUhYžcf'Zcf'h\Y'di fdcgY'cZh\Ya d`U[]Uf]g]b['UhiUbmh]a Yž'dUm]b['Ubch\Yf'dYfgcb'hc'dYfZcfa 'Ub'UWUXYa]WhUg_ž'ghYU']b['cf'UWei]f]b[Ubch\Yf'dYfgcb'g'UWUXYa]Wk cf_'UbX'Wcdm]b[']hz'cZYf]b['hc'Wca d'YhY'Ubch\Yf'dYfgcb'g'k cf_'cf'gYY_]b[dUma YbhZcf'Wca d'Yh]b['UWUXYa]Wk cf_"

±bUddfcdf]UhY`W]hUh]cb.`7]h]b[`gcifWrg`k\]W\`\UjY`bchVYYb`fYUXžk]h\cihUW_bck`YX[]b[`h\Y`´gYWcbXUfm´gcifWrZfca`k\]W\`_bck`YX[Y`cZh\Ya`\Ug`VYYb`cVhU]bYX"

8 i d`]\WUh]cb`ffgY`Zd`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`UggYgga Ybhcf\Wci fgY`UhI BGK `cf`Ubch\Yf`i b]j Yfg]\m'

7 cffYWnfYZYfYbW]b[dfUW]WYg.

- DUfUd\fug]b[ž'gi a a Uf]g]b[ž'YggUmk f]h]b['UbX'h]a Y'a UbU[Ya Ybh
- 5ddfcdf]UhY'i gY'cZUbX'Uhtf]Vi h]cb'Zcf'U'fUb[Y'cZa UhYf]U`g']bWi X]b['hYl hž']a U[Ygž'Zcfa i `UY'UbX WbWYdhg"

±0X]j]Xi U``Ugg]ghUbWr`]g`Uj U]`UV`Y`cb`fYei YghZfca `H\Y`@YUfb]b[`7 YbhfY`f\hd.#k k k "`Wi bgk "YXi "Ui #L" Ghi XYbhg`UfY`U`gc`fYa]bXYX`h\UhWUfYZ ``ha Ya UbU[Ya Ybh]g`Ub`]a dcfhUbhdUfhcZghi XmUbX`cbY`cZh\Y]XYbh]Z]YX`WUi gYg`cZd`U[]Uf]ga `]g`dccf`h]a Y`a UbU[Ya Ybh'`Ghi XYbhg`g\ci `X`U``ck `gi ZZ]W]Ybh'h]a Y`Zcf fYgYUfW\žXfUZn]b[`UbX`dfcdYf`fYZYfYbW]b[`cZgci fW*g`]b`dfYdUf]b[`U```UggYgga Ybh']hYa g"

IBGK "@]VfUfmU'gc'\Ug'h\Y'9@&9'hcc`'Uj U]`UV`Y'hc'Ugg]ghimci ik]h\'mci f'ghi Xm'Uhi BGK "'9@&9']g XYg][bYX'hc']bhfcXi WY'bYk 'ghi XYbhg'hc'ghi Xm]b['Uhil BGK 'Vi h']h\Wb'U'gc'VY'U'[fYUhifYZfYg\Yf'Xi f]b['mci f ghi Xm'

7 ca d'Yhjb['h\Y'9@&9'hi hcf]U`'UbX'ei]n'k]``'YbUV'Y'mci 'hc.

- UbU`mgY`hcd]\Mgž'd`Ub`fYgdcbgYg`UbX`cf[Ub]gY`fYgYUf\X\`Zcf`U\WJXYa]\Wkf]hjb[`UbX`ch\YfUggYggaYbhiHJg_g
- YZZYWIJ Y`mUbX`YZZWYbh`mZbX`Uddfcdf]UhY`]bZcfa Uh]cb`gci fWg`UbX`Yj U`i UhY`fY`Yj UbWY`hc`mci f bYYXg
- i gY`UbX`a UbU[Y`]bZcfa Uh]cb`YZZYWf]jY`mihc`UVWca d`]g\`U`gdYW]Z]Wdi fdcgY

5 WUX Ya] W = D Zcfa Uh] cb ·

: cf`YggYbhJU``gh XYbh]bZcfa UhJcb`fY`UhJb['hc.

fYei YghgʻZcfʻYl hYbg]cb/ `UhYʻgi Va]gg]cbgʻ[i]XY`]bYg/ fYj]Yk ʻcZa Uf_g/ I BGK ʻ< YUʻh\ 'UbXʻGUZYhmdc`]WJYg/