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INTRODUCTION

BORN FROM THE HEART of the Church, a Catholic University is located in that course of tradition which may be traced back to the very origin of the University as an institution. It has always been recognized as an incomparable centre of creativity and dissemination of knowledge for the good of humanity. By vocation, the Universitas magistrorum et scholarium is dedicated to research, to teaching and to the education of students who freely associate with their teachers in a common love of knowledge(1). With every other University it shares that gaudium de veritate, so precious to Saint Augustine, which is that joy of searching for, discovering and communicating truth(2) in every field of knowledge. A Catholic University's privileged task is "to unite existentially by intellectual effort two orders of reality that too frequently tend to be placed in opposition as though they were antithetical: the search for truth, and the certainty of already knowing the fount of truth"(3).2. For many years I myself was deeply enriched by the beneficial experience of university life: the ardent search for truth and its unselfish transmission to youth and to all those learning to think rigorously, so as to act rightly and to serve humanity better. Therefore, I desire to share with everyone my profound respect for Catholic Universities, and to express my great appreciation for the work that is being done in them in the various spheres of knowledge. In a particular way, I wish to manifest my joy at the numerous meetings which the Lord has permitted me to have in the course of my apostolic journeys with the Catholic University communities of various continents. They are for me a lively and promising sign of the fecundity of the Christian mind in the heart of every culture. They give me a wellfounded hope for a new flowering of Christian culture in the rich and varied context of our changing times, which certainly face serious challenges but which also bear so much promise under the action of the Spirit of truth and of love. It is also my desire to express my pleasure and gratitude to the very many Catholic scholars engaged in teaching and research in non-Catholic Universities. Their task as academics and scientists, lived out in the light of the Christian faith, is to be considered precious for the good of the Universities in which they teach. Their presence, in fact, is a continuous stimulus to the selfless search for truth and for the wisdom that comes from above.3. Since the beginning of this Pontificate, I have shared these ideas and sentiments with my closest collaborators, the Cardinals, with the Congregation for Catholic Education, and with men and women of culture throughout the world. In fact, the dialogue of the Church with the cultures of our times is that vital area where "the future of the Church and of the world is being played out as we conclude the

twentieth century"(4). There is only one cultre: that of man, by man and for man(5). And thanks to her Catholic Universities and their humanistic and scientific inheritance, the Church, expert in humanity, as my predecessor, Paul VI, expressed it at the United Nations(6), explores the mysteries of humanity and of the world, clarifying them in the light of Revelation.4. It is the honour and responsibility of a Catholic University to consecrate itself without reserve to the cause of truth. This is its way of serving at one and the same time both the dignity of man and the good of the Church, which

particularly the Bishops, Religious Congregations and ecclesial Institutions, and to the numerous laity who are committed to the great mission of higher education. Its purpose is that "the Christian mind may achieve, as it were, a public, persistent and universal presence in the whole enterprise of advancing higher culture and that the students of these institutions become people outstanding in learning, ready to shoulder society's heavier burdens and to witness the faith to the world"(12).10. In addition to Catholic Universities, I also turn to the many Catholic Institutions of higher education. According to their nature and proper objectives, they share some or all of the characteristics of a University and they offer their own contribution to the Church and to society, whether through research, education or professional training. While this Document specifically concerns Catholic Universities, it is also meant to include all Catholic Institutions of higher education engaged in instilling the Gospel message of Christ in souls and cultures. Therefore, it is with great trust and hope that I invite all Catholic Universities to pursue their irreplaceable task. Their mission appears increasingly necessary for the encounter of the Church with the development of the sciences and with the cultures of our age. Together with all my brother Bishops who share pastoral responsibility with me, I would like to manifest my deep conviction that a Catholic University is without any doubt one of the best instruments that the Church offers to our age which is searching for certainty and wisdom. Having the mission of bringing the Good News to everyone, the Church should never fail to interest herself in this Institution. By research and teaching, Catholic Universities assist the Church in the manner most appropriate to modern times to find cultural treasures both old and new, "nova et vetera", according to the words of Jesus(13).11. Finally, I turn to the whole Church, convinced that Catholic Universities are essential to her growth and to the development of Christian culture and human progress. For this reason, the entire ecclesial Community is invited to give its support to Catholic Institutions of higher education and to assist them in their process of development and renewal. It is invited in a special way to guard the rights and freedom of these Institutions in civil society, and to offer them economic aid, especially in those countries where they have more urgent need of it, and to furnish assistance in founding new Catholic Universities wherever this might be necessary. My hope is that these prescriptions, based on the teaching of Vatican Council II and the directives of the Code of Canon Law, will enable Catholic Universities and other Institutes of higher studies to fulfil their indispensable mission in the new advent of grace that is opening up to the new Millennium.

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]bhYf]cf'\Tci bhcZXYYd'i bXYfghUbX]b['h\Uhig'h\Y'K\cfX'cZ; cX\TUbX\Vmh\Y'\]YfUfW\mcZjUi'\yg'h\Uh
fYgi'hg\Tca']h\Tig'i b]ei Y'aUbbYf\Th\Y'7Uh\c`]W\ b]j\Yfg]hm\Y'dg'hc'aUb]Xyghh\Y'gidYf]j\M'cZ
qca Yh\]b['ch\Yf'h\Ub'h\Y'gYUfW\\Zcf'hh\''Zcf'hi h\f'f]-E"

(+"'6Yg]XYg'Wi'hi fU``X]U`c[i YžU'7Uh\c`]Wi b]j Yfg]hmži]b'UWktfXUbWi'j]h\]hg'gdYV]ZJWYbXgž'UbX _YYd]b[']b'a]bX'h\Y'j Uf]ci g'fY`][]ci g!Wi'hi fU`'WtbhYI hgž'Zc``ck]b['h\Y'X]fYWf]j Yg'dfca i `[UhYX'Vm Wta dYhYbhYWWg]Ugh]Wu'`Ui h\cf]hmž'Wb'cZZYf'U'Wtbhf]Vi h]cb'hc'YWia Yb]Wu``X]U`c[i Y"'±iXcYg'gc'hc Zi fh\Yf'h\Y'gYUfV\X'Zcf'i b]hmUa cb['U```7\f]gh]Ubg"'±o']bhYf!fY`][]ci g'X]U`c[i Y']hk]``'Ugg]gh]b X]gWfb]b['h\Y'gd]f]hi U`'j U`i Yg'h\UhUfY'dfYgYbh]b'h\Y'X]ZZYfYbhfY`][]cbg"

("'9j Ub[Y`]nUh]cb

(-"'6m']rg'j YfmbUhi fYžYUW\ 7 Uh\c`]W\ b]j Yfg]hma U_Yg'Ub]a dcfhUbhiVtblf]Vi h]cb hc h\Y 7\i fW\ fig k cf_cZYj Ub[Y`]nUh]cb" #i]g'U`]j]b[']bgh]hi h]cbU`k]hbYgg hc 7\f]ghUbX`\]g a YggU[Y`UfY`gh]``j]hu`m]a dcfhUbh]b W\hi fYg'a Uf_YX`VmgYW\`Uf]ga žcf'k\YfY`7\f]ghUbX`\]g a YggU[Y`UfY`gh]```j]fhi U`m i b_bck b"A cfYcj Yfž'U``h\Y`VUg]WUWUXYa]WUWhjj]h]Yg`cZU`7 Uh\c`]W\ b]j Yfg]hmUfY`WtbbYWhYX`k]h\ UbX`]b`\Ufa cbmk]h\ h\Y`Yj Ub[Y`]n]b[a]gg]cb cZh\Y`7\i fW\. fYgYUfW\ WUff]YX`ci h]b h\Y`][\hcZh\Y 7\f]gh]Ub a YggU[Y`k\]W\ di hg`bYk \i a Ub X]gWtj Yf]Yg`Uhh\Y`gYfj]W'`cZ]bX]j]Xi U`g`UbX`gcV]Yhm\Y\Xi WUh]cb cZYfYX`]b`U`ZU]h\!WtbhYl hh\UhZcfa g'a Yb`UbX`k ca Yb`WdUVY`cZfUh]cbU`UbX`Wf]h]W\\^\X[a YbhUbX`WtbgW]ci g`cZh\Y`hfUbgWbXYbhX][b]hmcZh\Y`\i a Ub dYfgcb/dfcZygg]cbU`HfU]b]b[h\Uh]b\WtfdcfUhYg`Yh\]W\`j U`i Yg`UbX`U`gYbgY`cZgYfj]W'`hc`]bX]j]Xi U`g`UbX`hc`gcV]Yhm\h\Y`X]U`c[i Yk]h\W\hi fY`h\Uha U_Yg`h\Y`ZU]h\`VYhhYf`i bXYfghccXž'UbX`h\Y`h\Yc`c[]WV`fYgYUfW\ h\UhHfUbg`UhYg`h\Y

`cVW``cf`fY[]cbU``"CfX]bUbWfg"ik]``VY`jU`]X`Zcf`U```7Uh\c`]WIb]jYfg]hJYg`UbX`ch\Yf`7Uh\c`]W\\bgh]hihYg
cZ<][\Yf`GhiX]Yg`]b`h\Y`fY[]cbžYIWfdhZcf`9WWg]UghJWU``Ib]jYfg]hJYg`UbX`:UWI`hJYg"`H\YgY``UhhYf
\bgh]hihJcbgž]bWiX]b[`9WWg]UghJWU`:UWI`hJYg`k\]W\UfY`dUfhcZU`7Uh\c`]WIb]jYfg]hmžUfY`[cjYfbYX
Vmh\Y`bcfag`cZh\Y`5dcghc`]W7cbgh]hihJcb'GUd]YbhJU`7\f]ghJUbUf() £"

z " "5 I b]j Yfg]hmYghUV]g\YX cf Uddfcj YX Vmih\Y < c`mGYYž VmUb '9d]gWcdU` 7 cbZ/fYbW cf Ubch\Yf 5ggYa V`mcZ7 Uh\c`]W<]YfUfW\nž cf VmU X]cW gUb '6]g\cd]g hc]bWcfdcfUhY h\YgY; YbYfU` Bcfa g UbX h\Y]f``cWU` UbX fY[]cbU` Udd`]WWh]cbg]bhc]hg [cj Yfb]b['XcWi a Ybhgž UbX WcbZcfa ']hg YI]gh]b[GhUhi hYg Vch\ hc h\Y; YbYfU` Bcfa g UbX hc h\Y]f` Udd`]WWh]cbgž UbX gi Va]hh\Ya 'Zcf` Uddfcj U` hc h\Y Wca dYhYbhYWWg]Ugh]WU` 5i h\cf]hm' =i]g WcbhYa d`UhYX h\ Uhch\Yf 7 Uh\c`]WI b]j Yfg]h]Ygž h\ Uh]gž h\ cgY bchYghUv`]g\YX cf` Uddfcj YX]b 'UbmcZh\Y UVcj Y k Ungž k]h\ h\YU[fYYa YbhcZh\Y`cWU` YWWg]Ugh]WW` 5i h\cf]hmž k]``a U_Y h\Y]f`ck b 'h\Y; YbYfU` Bcfa g 'UbX h\Y]f`cWU` UbX fY[]cbU`

5ff]WY' "H\Y'9gfUV]g\a YbhcZU'7Uh\c`]WI b]j Yfg]hm

 $z \% 5.7 \ Uh.c) W b] j Yfg] hma UmVY YghUV) g YX cf Uddfcj YX Vmh.Y < c mGYY z VmUb 9d] g WcdU 7 cb ZYfYb W cf Ubch.Yf 5ggYa V mcZ7 Uh.c) W [YfUfV M mz cf VmU X] c W g Ub 6] g \ cd''$

z '&" K]h\ 'h\ Y 'WobgYbhcZh\ Y 'X]cWrgUb '6]g\cdž'U '7 Uh\ c`]WI b]j Yfg]hmia UmiU`gc 'VY 'YghUV`]g\ YX 'VmiU F Y`][]ci gʻ≢bgh]hi hY 'cf'ch\ Yf'di V`]W/\ f]X]WU`'dYfgcb"

z""57Uhkc`]WIb]jYfg]hmaUmU`gc`VY`YghUV`]g\YX`Vmch\Yf`YWWYg]Ugh]WU``cf``UmdYfgcbg/giW\`Ub]jYfg]hmaUmfYZYf'hc`]hgY`ZUg`U`7Uh\c`]WIb]jYfg]hmcb`mk]h\'h\Y`WebgYbhcZh\Y`WeadYhYbh YWWYg]Ugh]WU``5ih\cf]hmž`]b`UWWefXUbWY`k]h\'h\Y`WebX]h]cbg'idcb'k\]W\'Vch\'dUfh]Yg`g\U``U[fYYf(, !''

z '("=b h\Y WwgYg`cZzz'%UbX'&z`h\Y`GhUhi hYg`a i ghVY`Uddfcj YX`Vmh\Y`Wta dYhYbhYVWYYg]Ugh]Ww`5 i h\cf]hm'i

5ff]WY ("H\YI b]j Yfg]hm7ca a i b]hm

z %"H\Y'fYgdcbg]V]]hmZcfa U]bhU]b]b['UbX'ghfYb[h\Yb]b['H\Y'7 Uh\c`]W]XYbh]hmcZh\Y'I b]j Yfg]hm fYghg'df]a Uf]mk]h\ h\Y'I b]j Yfg]hm]hgYZ'K \]Y'h\]g fYgdcbg]V]]hm]g Ybhfi ghYX'df]bV]dU`mhc i b]j Yfg]hmUi h\cf]h]Yg'f]bWi X]b[žk \Yb'h\Y'dcg]h]cbg'YI]ghž'h\Y'7 \UbW'`cf'UbX#cf'U'6cUfX'cZ Hfi ghYYg'cf'Yei]j U'YbhVcXnhž]h]g'g\UfYX']b'j Ufm]b['XY[fYYg'VmU``a Ya VYfg'cZh\Y'i b]j Yfg]hm Wa a i b]lmž'UbX'h\YfYZcfY'WU`g'Zcf'h\Y'fYWfi]ha YbhcZUXYei UhY'i b]j Yfg]hmdYfgcbbY`žYgdYV]U``m hYUW\Yfg'UbX'UXa]b]ghfUhcfgžk \c'UfY'Vch\ k]`]b['UbX'UV'Y'hc'dfca chY'h\Uh]XYbh]hm'H\Y']XYbh]hmcZ U'7 Uh\c`]WI b]j Yfg]hm]g'YggYbh]U``m`]b_YX'hc'h\Y'ei U`]hmcZ]hg'HYUW\Yfg'UbX'hc'fYgdYVhZcf'7 Uh\c`]W XcWhf]bY"'=i]g'h\Y'fYgdcbg]V]`]hmcZh\Y'Wa dYhYbh5i h\cf]hmhc'k UhW\'cj Yf'h\YgY'hk c'Zl bXUa YbhU` bYYXg']b'UW\cfXUbW'' k]h\ k\Uh]g']bX]WhYX']b'7 Ubcb'@Uk f(-L''

z '&" '5```HYUV\(Yfg`UbX`U```UXa]b]ghfUhcfgž'Uhh\\Y`h]a Y`cZh\Y]f`Uddc]bha Ybhž'UfY`hc`VY`]bZcfa YX`UVci h h\Y`7 Uh\c`]W]XYbh]hmcZh\Y`±bgh]hi h]cb`UbX`]hg`]a d`]WUh]cbgž'UbX`UVci hh\Y]f`fYgdcbg]V]`]hmhc`dfca chYž cf`Uh`YUghhc`fYgdYWbz'h\Uh]XYbh]hm'i

z " "= k Ung Uddfcdf]UhY hc h\Y:X]ZZYfYbhUVWXYa]WX]gV]d`]bYgž'U``7 Uh\c`]WhYUV\Yfg'UfY hc VY
ZU]h\Z\`hcž'UbX'U``ch\Yf'hYUW\Yfg'UfY hc fYgdYVhž'7 Uh\c`]WXcVhf]bY'UbX'a cfU`g`]b'h\Y]f'fYgYUfW\'UbX
hYUW\]b["'=b`dUff]W\`Ufz'7 Uh\c`]Wh\Yc`c[]Ubgž'Uk UfY'h\Uhh\YmZ\`Z]`U'a UbXUhY'fYWf]j YX'Zfca 'h\Y
7\i fW\ZUfY'hc VY'ZU]h\Z\`hYA U[]ghYf]i a 'cZh\Y'7\i fW\'Ug'h\Y'Ui h\Ybf]W]bhYfdfYhYf'cZGUWfYX
GWf]dhi fY'UbX'GUWfYX'HfUX]h]cbf)\$\\!

z ("H\cgY i b]j Yfg]hmhYUV\\Yfg UbX UXa]b]ghfUhcfg k \c VY`cb[hc ch\Yf 7 \i fV\\YgžYVW\Yg]U` Wta a i b]h]Ygž cf fY`][]cbgž Ug k Y`` Ug h\cgY k \c dfcZ\ygg bc fY`][]ci g VY`]YZ UbX U`gc U``ghi XYbhgž UfY hc fYWt[b]nY UbX fYgdYWh\Y X]gh]bWhjj Y 7 Uh\c`]W]XYbh]hmcZh\Y I b]j Yfg]hm' =b cfXYf bchhc YbXUb[Yf h\Y 7 Uh\c`]W]XYbh]hmcZh\Y I b]j Yfg]hmcf =bgh]hi hY cZ<][\Yf Ghi X]Ygž h\Y bi a VYf cZbcb!

7 Uh\c`]WhYUW\Yfg`g\ci`X`bchVY`U`ck YX`hc`Webgh]hi hY`U`a U^ef]hmk]h\]b`h\Y`≠ogh]hi h]cbžk\]W\`]g`UbX a i ghfYa U]b`7 Uh\c`]W

z') "'H\Y'YXi WUhjcb'cZghi XYbhg']g'hc'Wta V]bY'UWUXYa]WUbX'dfcZYgg]cbU`XYj Y`cda Ybhk]h\Zcfa Uhjcb']b'a cfU`'UbX'fY`][]ci g'df]bW]d'Yg'UbX'h\Y'gcV]U`'hYUW\]b[g'cZh\Y'7\i fW\/h\Y'dfc[fUa a Y cZghi X]Yg'Zcf'YUW\ cZh\Y'j Uf]ci g'dfcZYgg]cbg']g'hc']bWi XY'Ub''Uddfcdf]UhY'Yh\]WU`'Zcfa Uhjcb']b'h\Uh dfcZYgg]cb"'7ci fgYg']b'7Uh\c`]WXcWf]bY'UfY'hc'VY'a UXY'Uj U]'UV'Y'hc'U``ghi XYbhgf) %L"

5ff]/WY) " H\Y 7Uh\c`]WI b]j Yfg]hmk]h\]b h\Y 7\i fVK

z % '9j Yfm7 Uh\c`]WI b]j Yfg]hm]g hc a U]bhU]b Wa a i b]cb k]h\ h\Y i b]j YfgU`7\i fW\ UbX h\Y < c`m GYY/]h]g hc VY]b Wa a i b]cb k]h\ h\Y`cWU`7\i fW\ UbX]b dUff]WI`Uf k]h\ h\Y X]cWIgUb 6]g\cdg cZh\Y fY[]cb cf bUf]cb]b k \]W\]h]g``cWUhYX" =b k Ung Wabg]ghYbhk]h\]hg bUhi fY Ug`U I b]j Yfg]hmžU`7 Uh\c`]WI b]j Yfg]hmk]``Wabhf]Vi hY hc h\Y`7\i fW\fg k cf_cZYj Ub[Y`]nUh]cb"

z &"'9UW\'6]g\cd`\Ug`U`fYgdcbg]V]`]hmihc`dfca chY`h\Y`k Y`ZUfY`cZh\Y`7 Uh\c`]WI b]j Yfg]h]Yg`]b`\]g
X]cWfgY`UbX`\Ug`h\Y`f][\h\UbX`Xi hmihc`k Uh/N\'cj Yf`h\Y`dfYgYfj Uh]cb`UbX`ghfYb[h\Yb]b[`cZh\Y]f
7 Uh\c`]WW\UfUVWff"=ZdfcV`Ya g`g\ci `X`Uf]gY`WbbWfa]b[`h\]g`7 Uh\c`]WW\UfUVWfzh\Y``cWU``6]g\cd`]g
hc`hU_Y`h\Y`]b]h]Uh]j Yg`bYWfggUfmihc`fYgc`j Y`h\Y`a UhhYfzk cf_]b[`k]h\`h\Y`Wa dYhYbhi b]j Yfg]hm
Ui h\cf]h]Yg`]b`UWWcfXUbWf`k]h\`YghUV`]g\YX`dfcWfXi fYgf) &£'UbXz`]ZbYWfggUfmzk]h\`h\Y`\Y`d`cZh\Y
<c`mGYY"

z" "DYf]cX]WU`mžYUW\7Uh\c`]WI b]j Yfg]hmžhck\]W\5ff]XY" ž%UbX&fYZYfgž]ghcWtaaib]WUhYfY)j Ubh]bZcfaUh]cbUVcihh\YI b]j Yfg]hmUbX]hgUWhj]hjYghch\YWtadYhYbhYWWg]Ugh]WU`5ih\cf]hm"Ch\Yf7Uh\c`]WI b]j Yfg]hjYgUfYhcWtaaib]WUhYh\]g]bZcfaUh]cbhch\Y6]g\cdcZh\YX]cWfgY]bk\]W\hYdf]bW]dU`gYUhcZh\Y=bgh]hih]cb]g`cWUhYX"

5ft]WY * "'DUghcfU 'A]b]ghfm

z '%' 5 '7 Uh\c`]WI b]j Yfg]hm]g hc dfca chY h\Y dUghcfU`WUfY cZU``a Ya VYfg cZh\Y i b]j Yfg]hm Wa a i b]hmž UbX hc 'VY YgdYV]U`mUhhYbh]j Y hc h\Y gd]f]hi U`XYj Y`cda YbhcZh\cgY k \c 'UfY '7 Uh\c`]Wg" Df]cf]hm]g hc 'VY []j Yb hc h\cgY a YUbg k \]WX k]``ZUV]HUhY h\Y]bhY [fUh]cb cZ\i a Ub 'UbX dfcZYgg]cbU` YXi WUh]cb k]h\ fY`][]ci g j U`i Yg]b h\Y``][\hcZ7 Uh\c`]WXcWf]bYž]b cfXYf hc i b]hY]bhY``YWh U```YUfb]b[k]h\ h\Y fY`][]ci g X]a Ybg]cb cZ`]ZY"

z %"5 gi ZZWYbhibi a VYfcZei U ZYX dYcd Y!df]YghgžfY][]ci gž UbX `UmdYfgcbg! UfY hc VY Uddc]bhYX hc dfcj]XY dUghcfU a]b]ghfmZcfh,Y i b]j Yfg]hmWta a i b]hmž WUff]YX cb]b \ Ufa cbmUbX WtcdYfUh]cb k]h, h,Y dUghcfU` UWhj]h]Yg cZh,Y`cWU` 7 \ i fW, i bXYfh,Y [i]XUbWY cfk]h, h,Y Uddfcj U` cZh,Y X]cWYgUb 6]g\cd" 5 `` a Ya VYfg cZh,Y i b]j Yfg]hmWta a i b]hmUfY hc VY]bj]hYX hc Ugg]ghh,Y k cf_cZ dUghcfU` a]b]ghfmžUbX hc Wt` UVcfUhY]b]hg UWhj]h]Yg"

±i]g'k]h\ZYfjYbh\cdY'h\Uh=UXXfYgg'h\]g'8cWaYbhhc'U``h\YaYb'UbX'kcaYb'Yb[U[YX']b'jUf]cigkUng']b'h\Y'g][b]Z\Wbha]gg]cb'cZ7Uh\c`]W\][\Yf'YXiWbha

6Y`cj YX`6fch\Yfg`UbX`G]ghYfgža mYbWti fU[Ya YbhUbX`a mlfi gh[c`k]h\`nci `]b`nci f`k Y][\hmXU]`m hUg_h\UhVYWta Yg`Yj Yf`a cfY`]a dcfhUbhža cfY`i f[YbhUbX`bYWYggUfmcb`VY\U`ZcZ9j Ub[Y`]nUh]cb Zcf`h\Y`Z hi fY`cZWi`hi fY`UbX`cZU``Wi`hi fYg"'H\Y`7\i fW\`UbX`h\Y`k cfX`\Uj Y`[fYUhbYYX`cZnci f k]hbYgg`UbX`cZnci f`WUdUV`YžZfYYžUbX`fYgdcbg]V`Y`Wtblf]Vi h]cb"

;]j Yb]b F ca Yž UhGU]bhDYhYffgjz cb %) 5i [i ghž h\ Y Gc Ya b]hmcZh\ Y 5ggi a dh]cb cZh\ Y 6 YggYX

K cfX; Ui X]i a 'YhGdYgžb"')' . 55G'), 'fl% **\zd"'%\$+) "%+ '@fi b]j Yfg]hÅ 7 Uh\c`]ei Y XUbg 'Y a cbXY a cXYfbY"'8cWa Ybh ZbU`Xi &Äa Y`7cb[fÄgXYg'8ÅÅ[iÅgXYg'Ib]jYfg]hÅg'7Uh\c`]eiYgžFca Yž&\$!&-BcjYa VYf'%+&žz'%'% '=\/]X'% '>C<B D51 @=\(\vec{z}\)5"cWhcb"hc"h\Y"\(\vec{z}\)b"fbUhcbU"7cb[fYgg"cb"7Uh\c"]Whb]jYfg]h]Yg\(\vec{z}\)8) 5df]]'%, -\(\vec{z}\)b"(.'\(\vec{z}\)56", %f\(\vec{z}\), -\(\vec{z}\)d"'\&\%" 72" U'gc J 5H=75B 7C1B7 = ₹DUghcfU`7cbgh]hih]cb cb h\Y7\ifW\i]b h\YAcXYfb K cfX; *Ui X]i a 'YhGdYg*žb''*% 55G'), f% ** Łždd" "%, %1%, &" 7 UfX]bU BYk a Ub cVgYfj Yg h\UhU I b]j Yfg]hm "dfcZYggYg hc Ugg][b hc YUW\ ghi Xmk \]W\]hfYW]j Ygž]hg`dfcdYf`d`UWY`UbX`]hg`f\ghVci bXUf]Yg/hc`XYZ]bY`h\Y`f][\hgžhc`YghUV`]g\`h\Y`aihiU`fY`Uh]cbg`UbX`hc`YZZYWhh\Y]bh/fwtaaib]cbcZcbYUbXU``"fCd"V]hzd"()+t'&\$J5H=75B7CIB7=@=ZDUghcfU`7cbgh]hih]cbcbh\Y7\ifw\]bh\Y A cXYfb K cfX; *Ui X]i a 'YhGdYg*žb"' *. '55G'), 'fl% **½'d"'%\$) ("'Hc'U'[fci d'cZgV]Ybh]ghg'=dc]bhYX'ci hh\Uh''k\]Y'fYUgcb UbX ZUJIN gi fY mfYdfYgYbhlk c XJgl]bVl/icfXYfg cZ_bck YX[YžYUVN Ui hcbca ci g k]ln fY[UfX hc]hg ck b a Yn cXgž n Y lk c a i gh**z**|bu`mVebj Yf[Y`]b'h\Y`X]gVej YfmcZU'g]b[`Y`k\c`Y`fYU`]hmk\]W\\Ug`]hg`cf][]b`]b`; cX''''f|>C < B`D51 @=<u>*</u>5XXfYgg`Uh /\(\text{Y'A YYM}b[cb; U]\)Ycz-A Um%, 'zb"'.55G+) O%, 'Qid"*-\$L'\%>C<BD5I@=\(\text{2}\)5XXfYgg'UhI B9G7Cz\(\text{8}\)>ibY'\%, \\$\(\text{2}\) b"'&& '55G'+&'f%', \$\text{k}\d"+) \$\"'H\Y\"UghdUfhcZh\Y'ei chUhjcb'i gYg'k cfXg'X]fYV\YX'hc'h\Y'DcbhjZ\W\'5\WXYa mcZGV\YbW\gz % Bcj Ya VYf % +- . ' ≠bgY[bUa Ybh] X]';]cj Ubb] DUc c '=žJ c`" =#& f% +- ½ d" '%\$- "&& 7 Z J 5 H=7 5 B 7 C I B7 =@ =ž 8YWUfUhjcb cb 7Uh\c]W9Xi WUhjcb; fUj]gg]a i a '9Xi WUhjcb]gžb"'%\$. '55G), 'f1% ** Lžd"'+' +"&' 'J 5H=75B 7C1 B7 =@=_ž DUghcfU`7cbgh]hi h]cb`cb'h\Y'7\i fW\']b'h\Y'AcXYfb'KcfX'; Ui X]i a 'YhGdYgžb") - . '55G'), 'f% ** Łżd"'%\$, \$"'7UfX]bU` BYk a Ub XYgWfJvYg h, Y]XYU hc VY gci [\hi]b h,]g k Um "5 \UV]hcZa]bX]g Zcfa YX k \ JWk \Ughg h, fci [\ ``]ZY z c Zk \ JWk h, Y $\label{eq:continuity} \text{Uhhf]Vi hYgUhYZhYYXca } \begin{picture}(100,0) \put(0,0) \put($ DcghlGmbcXU`5dcghc]W9I\cfhUhjcb'7\flghjZXY`Yg`@U]Wb'\$8YWaVYf`%,,zb"'((.'55G',%f%,-\zd"(+-"&)'J5H=75B 7CIB7-@--₹8c[a Uh]W7cbgh]hi h]cb cb h\Y 7\i fW\ @ a Yb; Ybh]i a žb"' % 55G) + f% *) Łždd"' +!', "'7 Z'8YWfYY cb h\Y $5 dcghc`UhY`cZh\Y`@U]hm5 dcghc`] \textit{WWa}~~5 \textit{Wh}~cg] \textit{hUhYa}~~ \textit{Z}'dUgg] a~~. \\ 55G`)~,~~ \textit{f\%}~~ ** \textit{LZ''}7~\textit{Z''}U`gc~~;~~\textit{Ui}~X] i~~a~~YhGdYgZb"'('~.~) \\ +2 (-...) i~~ (-...) i~~$ 55G), f‰ **tzdd"%\$*%1%\$*("&* 7Z"J5H=75B 7C1B7=@=₹8YWUfUt]cb cb FY`][]ci g`@]VYftm8][b]tUt]g<ia UbUYzb"& 55G'), 'fl/6 ** Hz'dd"-' \$!-' %%+ >C < B 'D5I @=z'5XXfYgg'hc @YUXYfg'cZ7Uh\c`](\Yf'9Xi WUh]cbz'LUj]Yf'I b]j Yfg]hmcZ @ci]g]UbUžI "G"5"ž%&`GYdhYa VYf`%, +žb"`(.`55G`, \$`f%,, Łžd"`+*("&, 'J 5H=75B`7CI B7=@=_žDUghcfU``7cbgh]hi h]cb`cb h\Y'7\ifW\]b'h\Y'AcXYfb'KcfX'; UiX]ia YhGdYgžb")-. 55G), f% **Ezd"%\$, \$"&- '7Z'J5H=75B'7C1B7=@=_Z 8c[a Ut]W7cbgt]ti t]cb cb 8]j]bY F Yj Y Ut]cb 8Y] J YfVi a žbb", !%\$. 55G), 'f% **tz'dd", &\$!, &&" \$ 7 Z J 5H=7 5B 7CIB7-@--₹8c[a Uh]W7cbgh]hih]cb cb h\Y7\ifW\@a Yb; Ybh]ia žb"&). 55G) + fl% *) Łždd"&-!'%" %7Z" +bghfi Wh]cb cb'h\Y'9VVVYg]U`JcVWh]cb'cZh\Y'H\Yc`c[]Ub"cZh\Y'7cb[fY[Uh]cb'Zcf'h\Y'8cVVf]bY'cZh\Y': U]h\cZ&('A Um%-\$" &7Z' @YHYf`Dcdi`cfi a 'Dfc[fYgg]cžb"'%'55G') - f% * ++zd"&) +"" (""H\YfYZcfYz']b'h\Uhih\YfY`\Ug'VYYb'U'd'YUg]b['a i `h]d']WUh]cb cZW/blfYg cZ\][\Yf `YUfb]b[z´]h\Ug VYWca Y 'UddUfYbhlh\Uh]hk ci `X`VY cddcfh bY Zcf'h\Y ZUW `hmUbX'h\Y'U`i a b] hc i b]hY]b Wea a cb'UggcWjUljcb'k \]W\z'k cf_]b[']b'fYVJdfcWU'i bXYfglUbX]b['UbX'WcgY'We'`UVcfUljcbz'UbX'VUgYX'i dcb'h\Y'Ui h\cf]lmcZ h\Y'GidfYaY'DcbhJZZ:Ug'ZUh\Yf'UbX'ib]jYfgU'`XcVkcfz'h\Yma][\hacfY'YZJWUWJcig`mgdfYUX'UbX'YIhYbX'h\Y`][\hcZ7\f]gh''' fD'i g'L =25dcghc']W@YhYf'7*Uh\c']Wbg'Ghi X]cfi a 'I b]j Yfg]hUhYg*žk]h\'k\]W\'H\Y'=bhYfbUh]cbU': YXYfUh]cb'cZ7Uh\c']W $\label{thm:continuous} I b]j Yfg]h]Yg'k Ug'YghUV']g\YX. 55G'(\&'0\%') $Q'd'''' , *Ł''') `H\Y'7cXY'cZ7Ubcb'@Uk']bX]WUhYg'h\Y'[YbYfU``fYgdcbg]V]`]hmcZ' \\$ h\Y`6]g\cd`hckUfX`i b]j Yfg]hmghi XYbhg. "H\Y`X]cWfgUb`V]g\cd`]g`hc`\Uj Y`gYf]ci g`dUghcfU`WcbWfb Zcf`ghi XYbhg`VmYfYVMjb[$\label{eq:wbhyfguhi} \text{Wbhyfg'Uhi b]} \text{ } Yfg]h\text{Y}g\text{z'Yj Yb'bcb!} 7 \text{Uh}\text{\cite{thm}} \text{c'}] \text{WcbYgz'hc'} \text{ } \text{]} Y'\text{Ugg]}g\text{HUbWYz'YgdYV}]\text{U'mgd]}f\text{|hi U'hc'mci b['dYcd'Y''''fl'=7z'Wb'']}$, % Ł" * ~@jj]b[]b j Uf]ci g WJrW a głubW g Xi f]b['h\Y Wti fgY cZłja Yžh\Y 7 \i fW\žhccž\Ug i gYX]b \Yf dfYUW\]b['h\Y X]gWtj Yf]Yg`cZX]ZZYfYbhWl`hi fYg`hc`gdfYUX`UbX`YI d`U]b`h\Y`a YggU[Y`cZ7\f]ghhc`U``bUh]cbgžhc`dfcVY`]hUbX`a cfY`XYYd`m