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Q Morf) E (3 â † ã ‹Z 4 â † ã‹ and â † ã ‹x 3 0 3 1 â † ã‹ z 4 1 0 3 â † ã ‹‹ ‹‹ ‹‹ and 3 3 4 2 â † ã ‹x c a,) 72.2 (.qe morf) d (â † ãƒ8 51 41 5 81 1 soc 52 41 21 6 1 soc c a 1 soc Caâ¸ãƒ¸) 12.2 (.qe morf) c (5 21 c c b cbâ¸ãƒ¸ soc b yb nevig si) 4.1-2 noitces ees (C GNOLA B FO TENOPMOC EHT) B (41 3 â † ã ‹Z 2 â † ã‹ and â † 3 22 21 a,) 4.2 (.qe morf) A (: Noitulos .enalp eht ot ecneh dna, b dna a ot lanoogohtro c rotcev a sevig b dna a fo tc Udorp SSORC. 1 0 1 P TNIOP TA B OT LELLAAP Z2 â † ã ‹x B Nevig 61.2 Melborp. 3P OT 1P MORF B ROTCEV DNA 2P OT 1P MORF A ROTCEV DNIF .fu¸Â®Ã 21 rop ad es E lairotcev opmaC 3 â ‹Ãx 3 2 2 â ‹Ãy x â ‹Ã 3 3 2 2 y â ‹Ã 3 3 2 x 3 0 3 43.2 amelborp x â ‹Ãy x â ‹Ãx A ,etnemlaniF x x 0 â ‹Ãy â ‹Ãx 3 x x â ‹Ãy x â ‹Ã 0 B A ,B a lanogotro se A euq odaD 43 2 olutÃpaC ybalu-yb-soreinegni-rof-scitengamortcelE -rof-launam-noitulos/ue.tracknabtset//:ptth ne otelpmoc ovihcra 3 x â ‹Ãy x â ‹Ãx 2 1 x â ‹Ãy 0 x â ‹Ãx nu se a rotcev le y ,1 x x ne ¡Âtse 2P ,otnat ol roP .A sodad rotcev y aenÃL :31.2P arugiF X)0,0( )0,4(2P A B)2,0(1P Y ,X se P ed X adanedrooc al iS .1 :sosaP .Z" X onalp la olelarap onalp nu ne ¡Âtse adad aenÃl al ,y ed n³Ãicnuf anu se on aenÃl al ed n³Ãicauce al euq odaD .3 y ¸0 x se 1 aenÃl al ne otnup ortO .seicifrepus sal ed anu adac ed sonrotnoc sol ejubid n©Ãibmat .A ed ogral ol a B ed n³Ãicceyorp al se C ednod ,C y B ,A serotcev sol artseum arugif aL) b(2 a a b a a a b a a â ‹Ãa B â ‹Ãa C se A ed ogral ol a â ‹Ãa B ed lairotcev etnenopmoc lE .giF al ne artseum es euq ojeuqsob lE .2 1 1 4p ne 4 â ‹Ãz 2y 2x 2x â ‹Ãy 2y 2x 2y â ‹Ãx d)d(y ,2 4 ¬â ¯Ã 2 3p ne â ¯Ã nis â ¯Ã soc â ‹ÃZ â ¯Ã nis â ‹Ã â ¯Ã â ¯Ã soc â ‹Âr c)c(,2 0 1 2p ne 2y 2x â ‹Ãz 2z 2y 2x â ‹Ãy b)b(,2 1 1 1P ne 4 â ‹ÃZ ZX â ‹ÃY 2Y â ‹ÃX A)a(:sodacidni sotnup sol ne solraulave ogeul y sacir©Ãfse sadanedrooc ne serotcev setneiugis sol ramrofsnarT 13.2 amelborP â ‹Ã â ¯Ã â ‹ÃR 2 2 2 2 2 2 nes â ‹Ãz 2nis â ‹Ã â ¯Ã ¬â nis soc â ‹Âr ¬â ¯Ã ¬â ¯Ã 2 ¬â ¯Ã 3 5P ¬â ¯Ã ¬â ¯Ã 2 ¬â ¯Ã nis ¸Â®Ã nes â ‹Ãz ¸Â®Ã soc â ‹Ãz ¸Â®Ã nes â ‹Ãr 5p e ¬â ¯Ã ¬â ¯Ã 2 ¬â ¯Ã 3 5P ¬â ¯Ã ¸Â®Ã 2nis â â â ¯Ã â ¯Ã nis ¸Â®Ã nes â ‹Ãz ¸Â®Ã soc â ‹Ãz ¸Â®Ã nes â ‹Ãr e)e(21 â ‹Ã â ¯Ã â ‹Âr 4p d 0 â £Ã54 2 ¬â ¯Ã soc 2 4 ¬â ¯Ã 2 ¬â nis 2 4p 13 2 olutÃpaC ybalu-yb-soreinegni-rof-scitengamortcelE-roF- launam-launam-noitulos/ue.tracknabtset//:ptth ne otelpmoc ovihcra â ¯Ã 2soc â ‹Ã â ¯Ã â ‹Âr â ¯Ã 2soc â ‹Ã â ¯Ã ¸Â®Ã soc ¸Â®Ã nes â ‹Ãz ¸Â®Ã soc â ‹Ãr ¸ÃÃ niS ¸Â®Ã soc â ‹Ãz ¸Â®Ã niS â ‹ÃR D)D(4 â ‹ÃZ 707 0 â ‹ÃR 3P C 2 â £Ã54 2 2 1 1 1 naT 2 1 R 2 at point P 2 30 A. 60 A. Also, eq. (2.29) could be used together with the result of part (d). E rã 5r because î¸ solution: in p, e is given by 12 î¸â © 30 because of 60 a.e. 3 Without 60 A. 2 E Rã ‰ 5 2 because 30 EAU 867 R The component is normal on the spherical surface while the other two are tangential. c) In the cylovenic coordinate system, P3 12 tan 1 11 2 2 ï € 4 Rad 2 141 450 in the spherical coordinate system, p3 12 22 Tan 1 12 12 2 Tan 6 0616 rad ï € 4 rad 1 11 245 353 Effective 450 note that in cyloven and spherical coordinates, ï † is in Quadrant I. Solution: Z and x ï † = 30o Figure P2.24: Scheme of the section. b) In the cylovenic coordinate system, P2 02 Tan 1 00 3 0 rad 3 0 in the spherical coordinate system, P2 02 32 Tan 1 02 3 Tan 1 3 0 Rade Cylmon coordinates as spherical, ï † is arbitrary and can take any value. f) By repeated application of EQ. (2.27), A B C A X HE 16 AND HE 12 Z 9 X He 54 and HE 57 EQ. (2.33) It could also have been used. Vector A from 0 3 to 20 13 is to x 20 and to 13 3 x 20 202 102 and 10 500 A point in line 2 is x 0, and 2. For comfort, we chose the xâ € "z with y 0 plane. 2. Solution: The cross product of two vectors produces a new vector perpendicular to both of the original vectors. At point P, find: (a) the vector component of and perpendicular to the cylinder, (b) the vector component of e tangential to the cylinder. Solution: in p 1 0 3y and 2x 3z z x y, find a vector unit 1, b x 2 and 2 3 z he 1 x 2 and 5 z x 2 and 5 z x 2 and 5 z b We draw or demonstrate the space variation of a vector field, we often use arrows, as in Fig. Check led abeurP)a(:n³ÃiculoS .1 3 ¬â ¯Ã 2 a B y A a ralucidneprep oiratinu rotcev nU)b(¸ 0 0 2 ¬â ¯Ã 2 a ba¸Â®Ã)a(dniF â ¯Ã soc â ‹ÃZ â ¯Ã niS â ‹ÃR Z2 B R â ‹ÃZ â ¯Ã nis 4 r2 â ‹Ã â ¯Ã Z3 â Ã soC â ‹ÃR A serotceV sodaD 72.2 amelborP R 84 2 â ‹Ã â ¯Ã 50 1 â ‹Ã¸Â®Ã 90 0 â ‹Ã 25 0 â ‹Ã â ¯Ã C R 50 1 â ‹Ã¸ÃÂ 90 2 â ‹ÃR 3 â ‹Ã â ¯Ã 2 â ‹Ã B D :A a ralucidnepreP B ed lairotcev etnenopmoC)c(25 0 â ‹Ã â ¯Ã 50 1 â ‹Ã¸Â®Ã 90 2 R â ‹Ã 12 â ‹Ã â ¯Ã 4 2 R 2 â ‹Ã¸Â®Ã 4 â ‹Ã A C A C â ‹ÃA C :A ed n³Ãicceridl ne B ed lairotcev etnenopmoC)b(4 2 12 11 1 â ¯Ã 42¸Â®Ã 614R â ‹Ã â ‹Ã â ‹Ã 12 3 8 r 3 â ‹Ã â ¯Ã 2 â ‹Ã a a B â ‹ÃA B C :A ed n³Ãicceridl ne B ed ralacse etnenopmoC)a(82 2 olutÃpaC ybalu-yb-sreenigni-rof-scitengamortcele-rof-launam-noitulos/ue.tracknabtset//:ptth ne otelpmoc ovihcra :n³ÃiculoS .¬â ¯Ã 2 ¬â ¯Ã 4 6P y 2 ¬â ¯Ã ¬â ¯Ã 3 5P)c(,0 2 ¬â ¬â 4 4P y 1 3 ¬â ¯Ã 2 3P)b(,2 2 0 2P y 2 1 1 1P)a(:sotnup ed serap setneiugis sol ertne aicnatsid al enimreteD 92.2 amelborP 2 1 2 0 1 0 2 â ¯Ã soc 2¸Â®Ã nis 1¸Â®Ã soc 2¸Â®Ã soc 2r 1r2 1 1 â ¯Ã 4 9 soc ¬â ¯Ã soc 2 3 2 16 3 31 31 2 2 0 soc ¬â ¯Ã niS niS ¬â ¬â ¬â ¯Ã 4 9 12R 22R D)C(2 1 2 â ¯Ã soC 2R 1R2 38 2 2 18 2 2 1 4 6 01 4 4 2 4 soc 1 3 2 1 9 2 ¬â ¬â ¯Ã 2 1 2 1Z 2Z 1 â ¯Ã 21R 22R D)b (29 5 53 1 52 9 2 1 2 1 2 3 3 2 2 2 2 2 1 D)a(:n³ÃiculoS .A arap n³Ãiserpxe anu ertneucnE .aesed es omoc negiro le ala±Ães â ‹ÃC 47 0 â ‹ÃZ 65 0 â ‹ÃY 73 0 â ‹ÃX 3 3 23 2 2 821 2 46 3 Y 3 821 â ‹ÃZ 23 â ‹Ã 46 â ‹ÃX C C â ‹ÃC 3 Y 3 46 â ‹ÃX C .2 0 4 3P 2 ¬â ¯Ã nis 4 ¬â ¯Ã soc 4 3P Z Y X 3P)c(.Z2B X2B arap odatluser ortseun noc etnetsisnoc se otsE 3 2 ZB ,Z etnenopmoc lE ed ,y 3 4 41 3 65 2 9 02 4 XB 9 65 XB 41 2 ,X etnenopmoc led 2 3 41 2 Z2B X2B ,Z2B X2B arap n³ÃiculoseR .olugn¡Ãirt led sodal sod natneserper 4 â ‹ÃZ â ‹ÃY â ‹ÃX 3P 1P C y 4 â ‹ÃY 2 â ‹ÃX 2P 1P B aeS :n³ÃiculoS .0 0 2 ne ¡Âtse Q otnup le ,otnat ol roP . â ‹ÃC ed Triple product given by the equation. (2.29): of the equation. (2.27), A B Xë † AY BZ AZBY Yë † AZ BX AX BZ Zë † AX BY AY BX FULS EN HTTP://TESTBANKCARTE - lngeners-by-ulaby Chapter 2 9 b xë † bycz c a xë † cy az bzcy yë † bzcx bxcz zë † bxcy bycx cz ay Problem 2.6 Given V-Players A Xë † 2 Yë † Zë † 3 and B Xë † 3 Zë † 2, Find a C vector whose magnitude is 6 and whose direction is perpendicular to A and B., therefore, the intersection point is 20 13. and p1 (0.2) b to p2 (x, x -1) p4 (1, 0) x p3 (0, -1) Below we find a vector b that connects point p3 0 1 to point p4 1 0, Both are on the line. (a) In the cylindrical coordinate system, P1 12 22 Tan 1 2 1 0 5 1 107 rad 0 2 24 63 4â † 0 In the system of spherical coordinates, P1 12 22 02 Tan 1 12 22 0 Tan 5 ï € 2 rad 1 107 rad 1 2 1 2 24 90 0â † 63 4â † Please note that in Both the cylindrical and spherical coordinates, ï † is in quadrant I. They also draw the outline of the section. ï 2 € ï 2 € ï 2 € ï 2 € ï 2 € A vector field is administered at the cylindrical coordinates by E rë † r cos ï † † ë † r sin ï † Zë † Z2 Point P 4 € 2 is located on the cylinder surface described by R 4. Solution: (a) P1 R ï † Z P1 R SIN ï ï † R cos î î , p1 5 sen 0 0 5 cos 0 p1 0 5 (b) P2 kidneyn³ÃicceS 2 olutÃpaC 5 2 OLUTÃPAC .2 1 P otnup le ne A a olelarap dadinu ed rotcev nU © Ãxx 6 23 231 22 6 331 © Ãz 875 y 980 x 3 z 31 ognet y 2 # 2 # z 3 # # y 2 # # 3 x 3 # # Y # # A BA 6 C .aenÃl al arap n³Ãicauce al rop ,1 x y res euq eneit odanidrooc-y us secnotne ,x se 2P ed odanidrooc-x le iS . 2z © Ãz Ï nis re Ï nE E tE)b(.aenÃl al a ralucidneprep se A oreP 2 A ne ¡Âtse P otnat ol roP .B a omoc A a otnat ralucidneprep se C euq rartsom ,2 © Ãz 2 y 4 © Ãx C y ,3 y 2 © Ãx B ,© Ãz 3 y 2 eex A serotcev sodaD 2.2 amelborP 980 a z 540 x 422 2 A 2 a x A 422 4 1 2 a x 2 0 z 1 y 1 a a A 2 x A :n³ÃiculoS rartnocnE .negiro led sojel aicnatsid us a n³Ãicroporp ne etnemlaenil natnemua sedutignol sus y negiro led sojel etnemlaidar natnupa euq sahcelf ne etsisnoc ,s© Ãr E rotcev opmac le atneserper euq ,71.2P .Ï soc r 2z z z Ï nis r h Ï Ï soc r h r s© Ãr e s© Ãr s© Ãr nE)a(:n³ÃiculoS .31 y ad ,n³Ãicauce aremirp al ne azilitu es odnauc ,euq ,02 x ad amus aL .selanigiro serotcev sol ed sobma a ralucidneprep rotcev recret nu ecudorp serotcev sod ed odazurc otcudorp lE :n³ÃiculoS .n³Ãicaler atse recafsitas nebed setnenopmoc-z y -x sus orep ,A a seraluclidneprep res y B res naÃrdop euq serotcev ed otinifni oremºÃn nu yaH xB2 6 zB o zB 6 xB2 B A 0 ,)71.2(.qE odnazilitU . 32.2 melborP yb debircsed snemuloV :32.2P arugiF)b)a(x y y 5 x 2 2 5 z :n³ÃiculoS .2 0 3 61 0 ne 3P 0 8 ne 2P 4 0 0 ne 1P :sotnup sert setneiugis sol ajilE .2 Ï 4 3P)c(,0 3 2P)b(,3 4Ï 2 1P)a(:sanaisetrac a sacirdnÃlic sadanedrooc ed sotnup setneiugis sol ed sadanedrooc sal ritrevnoC 02.2 amelborP . eh r B y 2 eh z 8 eh Ï A , 0 2Ï 2 A)a(.5 Ï 0 2P 0 euqrop 5 Ï 0 nis 5 2P z 2 ¬â ¯Ã nis 3 3P Z â ¯Ã soc 3 ¬â 2 ¬â ¯Ã nis 3 3P Z â ¯Ã 2 olutÃpaC ybalu-yb-sreenigni-rof-scitengamortcele-rof-launam-noitulos/ue.tracknabtset//:ptth ne otelpmoc ovihcrA .)72.2(. n³Ãicauce noc a ºÃlave es odazurc otcudorp le ednod x 2 9 423 21 22 28 261 21 2 â ‹Ãz 8 â ‹Ãy 61 â ‹Ã 1 1 4 1 2 â ‹Ãz 4 2 x 2 â ‹ÃY 4 4 â ‹Ã 1 4 â ‹ÃZ â ‹ÃY â ‹ÃX 4 â ‹ÃY 2 â ‹ÃX 21 C B 2 1 A :olugn¡Ãirt lE ed aer¡Ã le se otse ed datim al ,)4.1-2 n³Ãicces al ne odazurc otcudorp led n³Ãicinifed al rev(omargolelarap led aer¡Ã le se odazurc otcudorp led dutingam al euq odaD .2 y 1 saenÃl :21.2P arugiF 03- 52- BA¸Â ®Ã 02- 51-)31- ,02(01- A B)3- ,0(53 03 52 02 02 51 01 01- 51- 02- 52- 03- 53-)2 ,0(01 51 02 52 03 11 2 otlutÃpaC ybalu-yb-sreenigni-rof-scitengamortcele-rof-launam-noitulos/ue.tracknabtset//:ptth ne otelpmoc ovihcra 8 y4 x3 21 y4 x2 :etnemaen¡Ãtlumis seonicauce sod sal odneivloser artneucne es n³Ãiccesretni ed otnup le :n³ÃiculoS .0 0 3 2p 0 0 nis 3 0 soc 3 2P z z y x 2p)b(3 14 1 14 1 1p 3 4 4 nes 2 ¬â ¬â soc 2 1p z â ¯Ã nes r â ¯Ã soc r 1p z y x 1P)a(:n³ÃiculoS .2-2 albaT al ne "sadanidrooc selbairaV" anmuloc al esu :n³ÃiculoS .adad aenÃl al somazart oremirP :.0 B n³Ãiculos anu odneivloser o ¸B A B A odneivloser y â 081 o â £Ã0 euf ba¸Â®Ã euq odneimusa odinetbo esrebah naÃrdop n©Ãibmat sodatluser sotsE .22.2 amelborp le rop satircsed seicifrepus :22.2P arugiF)e( )d( )c( )b(2 x)a(5 3 2 2 y 3/¬â ¯Ã = |Â®Ã â Ëç Â :NÃICULOS .II etnardauc le ne ¡Âtse â ¯Ã ,sacir©Ãfse y sacirdnÃlic sadanedrooc sal ne euq atneuc ne agneT 3 3 1 â £Ã0 531 â 521 02 5 dar 4 ¬â ¯Ã3 dar 781 2 3 3 naT 3 3 23 2 3 1 1 ,sacir©Ãfse sadanedrooc ed ametsis le ne dar 4 ¬â ¯Ã3 2 3 â £Ã0 531 42 4 3 3 3 3 naT 3 2 23 3 2 4P naT 23 2 3 4P ,sacirdnÃlic sadanedrooc ed ametsis le nE) D(32 2 olutÃpaC ybalu-yb-srenegni-rof-scitengamortcele-rof-launam-noitulos/ue.tracknabtset//:ptth ne otelpmoc ovihcrA .A ed n³Ãicceridl ae ne oiratinu rotcev nU 1 otnup le ne azneimoC A rotceV 1.2 amelborP arbeglÃ rotceV P3 3 π 0π. Solution: Procedure: 1. 1 2 and ends at point 2 1 0. Using this representation of arrow, sketches each of the following vector fields: (a) E1 x and, (b) E2 and he x, (c) E3 x and, (d) E4 x and and 2y, (e) E5 φé r, (f) E6 rés sin φ. Solution: From Table 2-2, A r= without θ z} because θ sin2 θ because θ φ φ because θ zφ φ φ θ because θ cos2 φ= φ) Problem 2.5 vectors dice A x a) A and A; A x a) A. and A., A., A. and A., read, A.bank and A. Solution: A C x 2 B C x 4 and 2 and 3 x 4 and has 2 8 z he 2 8 6 20 2 6 0 Problem 2.3 At Cartesian coordinates, the three angles of a triangle are P1 0 2 2, P2 2 2 2 2 and P3 1 2. Full file at CHAPTER 2 14 Problem 2.15 A certain plane is described by 2x 3y 4z 16 Find the normal drive vector to the surface in the direction away from the origin. A clear from the triangle that B CD or DB CB A B A2 A C D B Figure P2.14: Relationship between vectors A, B, C and D. Problem 2.4 Given A x he 2 and he 3 z he 1 and B x he Bx and ji 2 z he Bz : (a) find Bx and Bz if A is parallel to B; (b) find By a relationship between Bx and Bz if A is pericularand z ay bx 4 z 8 full file at 16 3 00 chapter 2 15 verify that c is orthogonal to a and b ac 64 128 512 512 8 32 0 4 0 643 16 3 128 3 512 3 3 3 3 solution: the vector 1x 3 Eution to the plane given to find three points, p1 φn and p3 in the plane. solution: complete file at chapter 2 20 (a) and e e-mails ¸Ï ¸Ï R C socR Ï eh Ï Ï soc ¸Ï euqrop © Ã¸Ï ¸Ï)c(5 © Ã Ï 0R 9440 mih ¸Ï 698 ¡Â 2P B 23 2 RETPAHC 1 0 ybalU-rop-sreenignE-rof-scitengamortcelE-rof-launaM-noituloS/ue.tracknabtset//:ptth ne otelpmoc ovihcrA 081 662 5 1 nat 2 2 2 1 nat 22 20 1 2 2P RR Ï soc 2R =Ï ¸Ï 3 nis Ï ¸Ï 3Ï nis ¸Ï euqrop 2R ×¸Ï ¸Ï euqrop ¸Ï nis Ï nis ¸Ï nis 2 Ë R B ¸Ï 2nis 2R¸Ï nis eh ¸Ï ¸Ï euqrop } R 2RÏ euqrop = Ï Ï Ï nis ¸Ï euqrop × ¸Ï Ï nis ¸Ï nis ×)b(2R 1P A 3212 eh Ï 8882 eh ¸Ï 658 etnemavitcefE 54 avitcefE 353 6 11 1 nat 2 1 2 21 1 nat Ï 3nis ¸Ï Ï Ï Ï Ï 2 Ï nis Ï euqrop Ï nis ¸Ï 2nis 2R ¸Ï 4 ¸Ï odacep ¸Ï ¸Ï ¸Ï ¸Ï ¸Ï ¸Ï ¸Ï ¸Ï ¸Ï ¸Ï ¸Ï ¸Ï ¸Ï ¸Ï ¸Ï ¸Ï ¸Ï ¸Ï nis ¸Ï euqrop ; ¸Ï Ï nis ¸Ï = R A }fireS snaS tfosorciMnf{ ¸Ï Ï euqrop ¸Ï odacep)a(:2-2 albat al eD :n³ÃiculoS .aenÃl al a lanogotro se A euq lat aenÃl al ne P otnup le ne animret y negiro le ne azneimoc anU rotceV 4 y2 x rop atircsed se adad aenÃl anU 526 005 051 004 1 se 31 02 2 1 se B y A ertne olugnÃ 526 51 eh y soc BA BA 31.2 melborP soc BA¸Ï 251 202 31 y 02 x B 02 a 2 0 ed B rotceV .ohcered odal la laugi se odreiuqzi odal le ,setnenopmoc sol arap senoiserpxe sal odnazinagroeR CyA :)72.2(.qE noc C B arap sonem ongis le arap revloser edeup es olos euq Z2B X2B 4 2 41 3 , y etnenopmoc led z2b x2b 4 41 zb â ‹Ãz 2 â ‹Ãy xb â ‹Ãx â ‹Ãz 3 â ‹Ãy 2 â ‹Ãx b b a a a o ,B â ‹ÃA A â ‹AA :satseupo u selaugi nos senoiccurtsni sus secnotne ,B a alelarap se A iS)a(:n³ÃiculoS 6 2 olutÃpaC YBALU-yB-sreenegni-rof-scitengamortcelE -rof-launaM-noituloS/ue.tracknabtset/ ///:ptth ne otelpmoc ovihcrA .A a ralucidneprep B ed lairotcev etnenopmoc lE)c(,A ed n³Ãicceridl ne B ed lairotcev etnenopmoc le)b(,A ed n³Ãicceridl al ne B ed ,n³Ãicceyorp o ,ralacse etnenopmoc lE)a(:ertneucnE 2R B 3 â ¯Ã â ¯Ã â ‹Ã 4R A â ‹Ã â ¯Ã 2 â ‹Ã¸Â®Ã â ‹Ã rop sacir©Ãfse sadanedrooc ne nad es B y A serotcev sol ,oicapse le ne odad otnup nu nE 62.2 amelborP .3 4 â ‹Ãz 3 61 4 â ‹ÃZ â ‹Ãy 4 0 8 â ‹Ãx 4 Z â ‹Ã 0 3 61 0 â ‹Ãz 0 â ‹Ãy 0 0 â ‹Ãx b 3p a 1p ed B rotceV 0 â ‹ÃY 0 8 â ‹ÃX A 2P a 1P ed A rotceV .6 â ‹ÃZ 3 â ‹Ãy F y 2 â ‹ÃZ 2 â ‹ÃY â ‹Ãx E ednod ,F y E serotcev sobma a ralucidneprep se noi lE otcerid oyuc y 4 se dutingam ayuc g rotcev nu artneucnE 23.2 amelborP 707 0 â ‹Ã â ¯Ã â £Ã62 53 nes 4 â £Ã54 2soc â £Ã54 â £Ã62 53 soc 4 â £Ã54 2soc â £Ã54 1 R 76 3 â â £Ã54 3nis â £Ã54 3soc â ‹Ã â ¯Ã ¸Â®Ã nes â £Ã62 53 soc â £Ã54 2nes â £Ã54 soc â £Ã62 53 soc â ‹Ã r 4p d nes â £Ã62 53 nes â £Ã54 2NIS â £Ã54 soC â £Ã62 53 niS â ‹Ã â £Ã54 1 1 37 1 â ‹Ã¸Â®Ã naT 2 1 1 â £Ã62 53 6 naT 4 1 1 4p 4p 4p 2 1 1 4p â ¯Ã 3soc â ‹Ã â ¯Ã ¸Â®Ã ¸Â®Ã nes 4 â ¯Ã 2soc â ¯Ã nes ¸Â®Ã soc â ¯Ã 2nes â ¯Ã soc ¸Â®Ã soc â Ã ¸Â®Ã soc 4 â ¯Ã 2soc â ¯Ã nes ¸Â®Ã nis â â 2nes â ¯Ã soc ¸Â®Ã nes r â ‹Ã â ¯Ã nes ‹Ã â ¯Ã â ¯Ã soc ¸Â®Ã soc â ‹Ã¸Â®Ã â Ã soc ¸Â®Ã nes â ‹Ãr d r 4 ¸Â®Ã nes â ‹Ã¸Â®Ã ¸Â®Ã soc â ‹Ã â ¯Ã 2soc ¸Â®Ã 2nes 2r â ¯Ã soc â ‹Ã â ¯Ã â ¯Ã nes eutaQ¸Â®Ã soc â ‹Ã¸Â®Ã â ¯Ã nes ¸Â®Ã nes â ‹Ã â ¯Ã 2soc ¸Â®Ã 2nes 2r â ¯Ã 2nes ¸Â®Ã 2nes 2r â ¯Ã 2nes ¸Â®Ã 2nes 2r)d(707 0 â ‹Ã â ¯Ã â £Ã54 â £Ã54 2 2 4 ¬â ¯Ã 2 2 2 0R 3P C 641 0 â ‹Ã¸Â®Ã 458 â ‹Ã naT 22 22 1 3P R â nis â ‹Ã â ¯Ã â ¯Ã nis ¸Â®Ã soc â ¯Ã soc â ‹Ã¸Â®Ã â ¯Ã nes ¸Â®Ã soc ¸Â®Ã nis â ¯Ã soc â ‹Ã â ¯Ã nis â ¯Ã soc ¸ÃÃ 4 e: d71.2p e e x e e e y) d (81 2 retpahc ybalu-yb-sreenigne-rof-scitengamortcele-rof-launam-nitulos/ue.tracknabtset //: ptth ta elif ^ + xx yy ^ = 3 e : c71.2p e e x e e e e e y) c (x Ã † ã ‹‹ ‹‹ 2E: b71.2p e e x e y) b (71 2 retpahc ybalu-yb-sreenigne-rof-nitulos/ue .tracknabtset //: ptth ta elif lluf yx ^ - = 1 e: a71.2p e e x e e y) a (: noitulos. X X EHT EVOBA H thgieh a ta sixa-z eht no detacol p tniop eht drawot detcerid rotcev tinu eht rof noisserpxe na dnif 01.2 melborp 01 2 retpahc ybalu-yb-sreenigne-rof-nnof-nnof-nnof-nnof-u /: PTTH TA Elif LLUF 2y 5 a 2 â ã ‹‹ ‹‹ ‹‹ ‹‹ ‹‹ ‹‹ ‹‹ ‹‹ Y 0 OT TNIOP SIHT MORF Rotcev eht .setanidrooc lacirehps ni 0 Â € Ã 3 6p DNA 0 2 Â € Ã 2 5p) C (Setanidrooc lacirdnilyc ni 4 4 € Ã 3 4P DNA 2 4 € Ã 1 3P) B (, Setanidrooc nais ETRAC NI 2 3 2 2P DNA 3 2 1 1P) A (: Stniop Fo SRIAP Gniwollof EHT NEEWTEB ECNATSID EHT DNIF 82.2 Melborp 92 2 Retpahc 3 2 1 Ybalu-Yb-Sreenigne-Rof-SCITENGAMORTCELE-ROF-Launam-Noitulos/ue.tracknabtset //: ptth ta elif ‹‹ ‹‹ ‹‹ ‹‹ ‹ã ã ã ã ã ã ã ã ã ã 784 0. ‹R 3 21 1 4 b aa b yb nevig si b dna a htob ot ralucidneprep rotcev tinu a, b dna a htob ot ralucidneprep si b a ecnis .4 z, 0 x rof.) 71.2 melborp (R .Tracknabtset //: Ptth Ta Elif lluf .p ta enil eht no sdne dna nigiro eht ta strats a rotcev 2 â ã ‹‹ â ã ã ã ã ã ã ã ã ã Ã ‹x b: enil eht no era hcihw fo htob, 0 4 2p ot 2 0 1p tniop stcennoc hcihw b rotcev dnif ew txen.) t snaem Ïd 0 2 Ï Ï 2 r zr A 5 Ï ,)c34.2(.qE odnasU)b 52 2 OLUTÃPAC 5 ybalU-yb-sreenignE-rof-scitengamortcelE-rof-launaM-noituloS/ue.tracknabtset//:ptth ta elif lluF Ï4 2 z 2 0 3 Ï ÏzÏ3 zd Ïd 3 rr 0 Ï 3 Ï z 2 A ,)a34.2(.qE ed n³ÃicazilitU)a .adad aenÃl al ne sotnup sod somartnocne ,oremirP :n³ÃiculoS 4 z x2 rop atircsed aenÃl al ed senoiccerid sal ed areiuqlauc a olelarap dadinu ed rotcev nu rartnocnE 2 1 22 h 2 y x 2 2 2 h y eh y x 2 h z y eh y x 2 h A A A y 2 1 2 2 h eh z y 0 ognet y x 11.2 amelborP a 2 x A 0 eh x A :se h 0 P a 2 y x Q ed A rotceV .h 0 a ¡Âtse P 3 Ï 0 ;3Ï ¸Ï 0 ;2 R)d(,2 z 2 ;4Ï Ï ;5 r 2)c(,0 z ;Ï Ï 2Ï ;5 r 2)b(,2 z 2 ;3Ï Ï 0 ;3 r)a(:seicifrepus setneiugis sal ed anu adac ed aer¡Ã le ranimreted arap sd laicnerefid eicifrepus al arap adauceda n³Ãiserpxe al razilitU 22.2 amelborP .nemulov adac ed ameuqse le rajeuqsob n©ÃibmaT .4 s©Ãr Ï soc 4 =r nE ,2 Ï 4 P tA .Ï 2Ï 3 3P)c(,Ï 0 5 2P)b(,0 5 1P)a(:sacirdnÃlic a sacir©Ãfse sadanedrooc sal ed sotnup setneiugis sol ed sadanedrooc sal ritrevnoC 12.2 amelborP .2x 4 x 4 res euq eneit odanidrooc-y us secnotne .2Ï 2Ï 2 P ne olraulave ogeul y sacirdnÃlic sadanedrooc ne Ï nis =Ï 2soc ¸Ï Ï soc ¸Ï 2nis R A rotcev le ramrofsnarT 53.2 amelborP 62 Ï 51 ©Ã¸Ï tE ,otnat ol roP .4 0 se P otnup ,otnat ol roP 1 4 Ï z 27 r A ¸ 1 3Ï 2 A)A 09 BA 0 1 soc BA B A 1 soc BA¸Ï ,)12.2(.qE morF .Ï soc r 4E)d(,x1 ©Ãy 3E)c(,©ÃÏ 2E)b(,y y y x 1E)a(:selairotcev sopmac setneiugis sol ed onu adac rajubid arap sahcelf rasU 81.2 Ïnis r ^ = 6 E :f71.2P E E E x E y)f 91 2 OLUTÃPAC ybalU-yb-sreenignE-rof-scitengamortcelE-rof-launaM-noituloS/ue.tracknabtset//:ptth ta elif lluF rÏ ^ = 5 E :e71.2P E E x E y)e(^ + xx y2 y ^ â†Ã‹a B ,noitiinifed yb)A(:noitulos 2 a b d a b d a b nevig si a ot ralucidnepride b fo tenenopmoc rotcev eht sa denifed d rotcev eht)B(DNA ,A fo Rotcev Tiinu Eht Si â†Ã‹a Erehw 2 A â†Ã‹a B â†Ã‹a C A B A YB Nevig Si a fo noitcerid eht ni b fo tnenopmoc rotcev eht sa denifed c RotceV eht)A(31 2 retpahc ybalu-yb-sreenigne-rof-scitengamortcele-rof-launam-noitulos/ue.tracknabtset//:Ptth llif ,b DNA a Srotcev owt Nevig ,Taht Wohs x 6 1 â†Ã‹Y 8 0 â†Ã‹ 2 8 0 5 8 0 4 ro 0 x 0 2 â†Ã‹x 4 41.2 Melborp â†Ã‹Y 8 0 â†Ã‹x A ,Ecneh x 4 2 x4 â†Ã‹Y X â†Ã‹x 0 Xa 4 B ,Ecneh .Noitulos eht Ni Desu Neb Evah Osla Dluoc)52.2(.Qeing DNA)92.2(.Q 1 â†Ã‹x â†Ã‹x â†Ã‹x â†Ã‹x â†ã â†ã ‹Y A ,)71.2(.Qee DNA)72.2(.Qe morf)H(4 â†Ã‹Z B â†Ã‹x ,)72.2(.Qe morf)G(8 2 retpahc â†Ã‹z Ybalu-yb-ybalu-yb-srenigne-rof-scitengamortcele-rof-launam-noitulos/ue.tracknabtset//:Ptth ta elif .noitcerd etitippo eht Gnola rehtona DNA F e gno La Eno ,Snoitiidnoc 33 2 Retpahc ybalu-yb-yb-sreenigne-rof-scitengamortcele-rof-launam-noitulos/ue.tracknabtset//:ptth ta luf ets eht yfstas yfistas srotcev owt .)4 tcudorp tod rieht neht ,b ot ralucidneprep you a and)b(.2 z dna 1 x yb rebidcsed ened eht no tinop yrarribra na morf nigro eht drawot detcent of tinu eht rof nosserpxe na Dnif 9.2 Melbop 2p ta enil eht no sdne dna 2 0 1p ta strats a rotcev â†Ã‹x 1