

NST Part IA Mathematics Supervision Questions: Dr Ian Rudy

An asterisk (*) means a question is harder than most.

Michaelmas Term

Supervision 1: Examples I A3, A4, A5, A6, A7*, B3, B4, B7, B8. Some notes on these:

A6: "concurrent" means "meet at a point".

A7: "coplanar" means the three points *and* the origin lie in a plane; "collinear" here means the three points all lie on a straight line. I think you need to assume the vectors **a**, **b**, **c** are *not* parallel to do the question.

Supervision 2: Examples I B10, B12, B13, C2, C3, C5*, C6*, C7, C11.

Supervision 3: See my tutorial on vector areas first, at http://people.pwf.cam.ac.uk/iar1/teaching/Vector_Areas_Tutorial.pdf.

Examples I D1* (Note that all mentions of OBCD should say OBDC), D2*, E3, E4 (except don't bother with the very last bit - (e) of part (iii) - unless you are interested), F1 (except part (h), which is dull), F5, F7, F8, F10.

Supervision 4: Examples I F11 (look up the standard methodology if you don't already know it), F12, F14, F15, F16*, F18, F19, G3, H4, H5.

Supervision 5: Examples I I1*, J1, K1, K2, L1, L2, M1, M2, N1, N3. Make sure you read my email on limits and series before attempting K1, K1, L1, L2.

Supervision 6: Examples I G4, Examples II P4, P5, P6 ((d) is hard if you don't know the method, and the point of (e) is lost on me), P7, P10 (for the very last bit of this, they mean you to write $I+iJ$ in terms of the original integrals, not the solutions you have just found, so it is a new method of finding the integrals), P11, P12 (i)-(iii), P13*, P15

Supervision 7: See my guide on multiple integrals (the sheet I gave you, or online at: http://people.pwf.cam.ac.uk/iar1/teaching/nst1a_maths_multiple_integrals_tutorial.pdf). Examples II Q1, Q2, Q3 (except not the bit involving xe^{xy} , which is dull), Q4, Q5, Q6, Q7 (though do it any way you like - doesn't have to be induction), Q8

Supervision 8: Examples II R1, R3, R4, R6, R7, R8, R10, R11, R12 and (optional) R13*. You could also look at R14 and R15 for amusement if you are interested.

Vacation Work: tripos questions (see the sheet I gave you, , or find it at: http://people.pwf.cam.ac.uk/iar1/teaching/nst1a_maths_supervision_questions_xmas_vac_tripos_questions.pdf)

Lent Term

Supervision 1: Examples I S3, S4, 6, 7, 8, plus 1991 I 7 from the sheet I gave you (http://people.pwf.cam.ac.uk/iar1/teaching/nst1a_maths_supervision_questions_ode_extra_questions.pdf).

A big hint: make sure you know how to solve the Bernoulli differential equation. See (eg) Stephenson's book "Mathematical Methods for Science Students", or Wikipedia.

Supervision 2: Examples I 9, 12, 13, plus 1988 II 9 from the sheet I gave you (http://people.pwf.cam.ac.uk/iar1/teaching/nst1a_maths_supervision_questions_ode_extra_questions.pdf).

Supervision 3: Examples II 4, 6, 7, 8, 9 (difficult unless you know the standard method), 10 (but ignore their advice about $\mu(x)$ or $\mu(y)$ - find an integrating factor any way you like).

Supervision 4: 1985 II 6 from the sheet I gave you (http://people.pwf.cam.ac.uk/iar1/teaching/nst1a_maths_supervision_questions_lent_term_tripos_questions.pdf), Examples II 14, 16 (not (c) - it's just tedious, but do note that you have to determine the character of the stationary values in (a) and (b)), 11, 12, 13. And yes, I mean do them in that order: 11, 12, 13 are on a topic that may confuse you.

Supervision 5: 1984 I 6 and 1983 II 5 from the sheet I gave you (http://people.pwf.cam.ac.uk/iar1/teaching/nst1a_maths_supervision_questions_lent_term_tripos_questions.pdf), Examples II 17, 18 and (optional) 21.

Supervision 6: Examples III 6, 7, 9, 10, 11, 12, 13, plus 1985 I 8 from the sheet I gave you (http://people.pwf.cam.ac.uk/iar1/teaching/nst1a_maths_supervision_questions_lent_term_tripos_questions.pdf).

Supervision 7: Examples III S3 and S4 from the Skills section, 14, 16, 17, 18, 19, 20.

Supervision 8: See the summary sheet I gave you (http://people.pwf.cam.ac.uk/iar1/teaching/nst1a_maths_fourier_summary.pdf) and then try Examples III 21, 23, 24, 25 (you may well not understand the * bit), 26, 28, plus 1986 I 6 from the sheet I gave you (http://people.pwf.cam.ac.uk/iar1/teaching/nst1a_maths_supervision_questions_lent_term_tripos_questions.pdf).

Vacation Work: tripos questions (see the sheet I gave you, or find it at: http://people.pwf.cam.ac.uk/iar1/teaching/nst1a_maths_supervision_questions_easter_vac_tripos_questions.pdf)

Easter Term

Supervision 1: Examples I 4, 6, 9, 10, 11, 12, 13, 14, 15.

Supervision 2: Any of the suffix notation questions from last week we didn't go over, plus: Examples I 16, 17, 18, 19, 20, 24, plus 1988 II 3 and 1988 I 3 from the sheet I gave you (http://people.pwf.cam.ac.uk/iar1/teaching/nst1a_maths_supervision_questions_easter_term_tripos_questions.pdf).

Supervision 3: Examples I 25 (except you use any method you want for the last part - ignore their instruction), 27 (leave the harder part if you don't understand it), 28, 29, 30, plus 1986 I 3 and 1990 II 12 from the sheet I gave you (http://people.pwf.cam.ac.uk/iar1/teaching/nst1a_maths_supervision_questions_easter_term_tripos_questions.pdf).

Supervision 4: Examples II 1, 3 (optional, and ignore their hint in the final paragraph regarding "Show that..." - you find the solution any way you like), 4 (not easy), 5, 6 (optional)