

NST/CST Part IA Mathematics Supervision Questions: Dr Ian Rudy

An asterisk (*) means a question is harder than most. Note that you will need a calculator for some questions, even though you are not allowed one in the exam.

Michaelmas Term

<p>Supervision 1: Examples I A3, A4, A5, A6, A7*, B3, B4, B7, B8. Some notes on these:</p> <p>A6: "concurrent" means "meet at a point".</p> <p>A7: "coplanar" means the three points <i>and</i> 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 <i>not</i> parallel to do the question.</p>
<p>Supervision 2: Examples I B10, B12, B13, C2, C3, C4, C5*, C6*, C7 (note that the phrase "passing through the points" refers to the flat surface and not the drill!), C11.</p>
<p>Supervision 3: See my tutorial on vector areas first, at https://tinyurl.com/y67ctwb4.</p> <p>Examples I D1* (in (i) please could you find the projected area as a scalar, not a vector, and note that in (ii), the surface excludes the base and so is just the upper four triangular surfaces), D2* (note that there are <i>two</i> separate sets of parts (i) and (ii), one of which is over the page), 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.</p>
<p>Supervision 4: Examples I F11 (look up the standard methodology if you don't already know it), F12, F14, F15, F16*, F18, F19, G3, G4 H4, H5 (except part (a), which is dull).</p>
<p>Supervision 5: Examples I J1 (including (iii),(iv),(v)), K1, K2, L1, L2, N1, N3, I1* (do last). Make sure you read my advice on limits and series (https://tinyurl.com/y2gyek88) before attempting K1, K1, L1, L2. If you are confused by N1 and/or the big O notation, please see https://tinyurl.com/yy9mutfe. <u>Optional</u>, as it's non-examinable, but if you want to understand the ϵ-δ definition of a limit, see https://tinyurl.com/y59xpnbf.</p>
<p>Supervision 6: Examples I M1, M2, Examples II [NB: Take care you don't pick up the Course A Examples Sheet on Moodle] P4, P5, P6 ((d) is hard if you don't know the method; (e) could be trivial for you), 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, P13, P15.</p>
<p>Supervision 7: See my guide on multiple integrals (online at: https://tinyurl.com/y5f9ow4c). 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</p>
<p>Supervision 8: Examples II R1, R3, R4, R6, R7, R8, R10, R11, R12 and (optional) R13*. You could also look at R14 for amusement if you are interested.</p>
<p>Vacation Work: tripos questions:https://tinyurl.com/yxfb8z7a Calculators allowed</p>

Lent Term

Supervision 1: A big hint: make sure you know how to solve the Bernoulli differential equation. See (eg) Wikipedia. Be careful you use the Examples sheets for the B course and not the A course, which appear before them on Moodle! Examples I S3, S4, 6, 7, 8, plus 1991 I 7 from <https://tinyurl.com/y4v66neh>.

Supervision 2: Examples I 9, 12, 13, plus 1988 II 9 from <https://tinyurl.com/y4v66neh>.

Supervision 3: Michaelmas Term Examples II P12 (i)-(iii) [we'll do this now that you have covered partial differentiation], and (the rest needs lecturer to have covered Section 2.2.9 of the notes.) Lent Term Examples II 4, 6, 7, 8, 9 (difficult unless you know the standard method).

Supervision 4: Examples II 10 (but ignore their advice about $\mu(x)$ or $\mu(y)$ - find an integrating factor any way you like), 11, 12, 13.

Supervision 5: Any parts of 13 that you did not do for last week. Then 1985 II 6 from <https://tinyurl.com/y2e818oo>, 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)), 17, 18, plus (both entirely optional) 21 and 1984 I 6 from <https://tinyurl.com/y2e818oo>.

Supervision 6: Examples III 6, 7, 9, 10 (is very short), 11, 12, 13, plus 1985 I 8 from <https://tinyurl.com/y2e818oo>.

Supervision 7: Examples III S3 and S4 from the Skills section, 14, 16 (please do not use the Divergence Theorem on it), 17, 18, 19, 20.

Supervision 8: Examples III 21, 23, 24, 25 (you may well not understand the * bit), 26, 28, plus 1986 I 6 from <https://tinyurl.com/y2e818oo>.

Vacation Work: I'll not be setting any vacation work explicitly, but you should attempt as many past tripos questions as you have time for. Use my webpage links to find my comments on past questions and bottom line answers to them.

Easter Term

Supervision 1: Examples I 3, 5, 6, 7, 8, 9, 10, 11. You might usefully have a look at my tutorial on suffix notation at <https://tinyurl.com/bdrau49h> before attempting 6, 7 and 8. The current lecturer uses upper case for suffix notation, but past lecturers, and exam questions used lower case.

Supervision 2: Any of the suffix notation questions from last week we didn't go over (eg 6 and/or 7(ii)), plus: Examples I 12, 13, 14, 15, 17, 22, plus 1988 II 3 and 1988 I 3 from <https://tinyurl.com/y5y2floy>.

Supervision 3: Examples I 24, 25, 26, 27, 31 (leave the harder part if you don't understand it) plus 1990 II 12 and 1986 I 3 from <https://tinyurl.com/y5y2floy>.

Supervision 4: From <https://tinyurl.com/mr2dycsv> (I'm using the 2021 questions as I prefer that version of question 4): 1, 3 (optional, and ignore their hint in the final paragraph regarding "Show that..." - find the solution any way you like), 4 (not easy), 5, 6 (optional).