NST 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

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, C4, C5*, C6*, C7, C11.
Supervision 3: See my tutorial on vector areas first, at http://tinyurl.com/hzes338. 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. Note also there are *two* separate sets of parts (i) and (ii), one of which is over the page), 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 (except part (a), which is dull).
Supervision 5: Examples I J1 (including (iii),(iv),(v)), K1, K2, L1, L2, M1, M2, N1, N3, I1* (do last). Make sure you read my advice on limits and series (http://tinyurl.com/zszarrr) 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; (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, P12 (i)-(iii), P13*, P15
Supervision 7: See my guide on multiple integrals (online at: http://tinyurl.com/zlbyap5). 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 for amusement if you are interested.
Vacation Work: tripos questions (see the sheet I gave you, or find it at: http://tinyurl.com/gkrrydj)

Lent Term

Supervision 1: A big hint: make sure you know how to solve the Bernoulli differential equation. See (eg) Wikipedia. Examples I S3, S4, 6, 7, 8, plus 1991 I 7 from the sheet I gave you (http://tinyurl.com/z5e7nl3).
Supervision 2: Examples I 9, 12, 13, plus 1988 II 9 from the sheet I gave you (http://tinyurl.com/z5e7nl3).
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). Question 10 needs the lecture notes up to and including section 2.2.11; the others need the notes up to and including 2.2.9, so if you've not done them by the time you come to do the work, then we will need to liaise.
Supervision 4: 1985 II 6 from the sheet I gave you (http://tinyurl.com/h5htgqd), Examples II 11, 12, 13, 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))
Supervision 5: Any of 13(iii), (iv) that you did not do for last week. Then 1984 I 6 and 1983 II 5 from the sheet I gave you (http://tinyurl.com/h5htgqd), Examples II 17, 18 and (optional) 21.
Supervision 6: Examples III 6, 7, 9, 10 (is very short), 11, 12, 13, plus 1985 I 8 from the sheet I gave you (http://tinyurl.com/h5htgqd).
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 the sheet I gave you (http://tinyurl.com/h5htgqd).
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.