

Math 427L (Rusin) — FINAL EXAM, free response questions

This final is to be taken following the same rules we used for Exam 2. The details may be found at

<http://web.ma.utexas.edu/users/rusin/427L-20a/final-rules>

These three free-response questions are worth 7 points each. I need to see the part of your work that leads you to the right answer. Make sure you write out your answers, scan them, and upload them to Canvas by Saturday at 10pm Austin time.

Also go to Quest to find multiple-choice questions, worth 5 points each. You have four hours to complete that portion after you start. You must also finish that portion by Saturday at 10pm Austin time.

Good luck

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FR1. Find the plane which is tangent to the surface  $2x^2 - 3y^2 + z^2 = 9$  at the point  $(2, 1, 2)$

FR2. The curve  $C$  is parameterized by  $\varphi(t) = (3 - 2t)\mathbf{i} + \ln(3t)\mathbf{j} + (2 - t^2)\mathbf{k}$ . Find the length (arclength) of  $C$  between  $\varphi(1)$  and  $\varphi(4)$ .

FR3. Evaluate the triple integral

$$I = \int \int \int_E 2xyz \, dx \, dy \, dz,$$

where  $E$  is the set of all points  $(x, y, z)$  in  $\mathbf{R}^3$  such that

$$0 \leq x \leq \sqrt{4 - y^2} \quad \text{and} \quad 0 \leq z \leq y \leq 2$$

Extra Credit (up to 4 points). As of this writing it is unclear how classes will run in the Fall. I remain hopeful that students and faculty will meet in classrooms as we used to in the Good Old Days. But it is quite possible that, at least at the beginning of the semester, classes will run remotely.

What mechanisms would you recommend we use in the Math department to teach courses like Math 427L? What aspects of our remote teaching worked well and which did not? What did you learn from other courses that we could try? How should we conduct our exams (in a semester in which grades really count)?