Math 2130 Practice Final (Spring 2017)

Before the exam:

- Do not write anything on this page.
- Do not open the exam.
- Turn off your cell phone.
- Make sure your books, notes, and electronics are not visible during the exam.
- Do not wear headphones during the exam.

When you open your exam:

- Make sure your exam has all its pages. There are 8 pages, including the last, and 8 problems.
- If you believe there is a printing error, let me know right away.
- Write your name on the last page, and put a check in the box corresponding to your section.

During the exam:

- Do not talk or ask questions. If you are unsure what a question is asking, demonstrate your understanding as best you can.
- Be respectful of your fellow classmates.
- You may use the bathroom during the exam, but please ask first so I can keep track of who is out of the room at any one time.

Notes on grading:

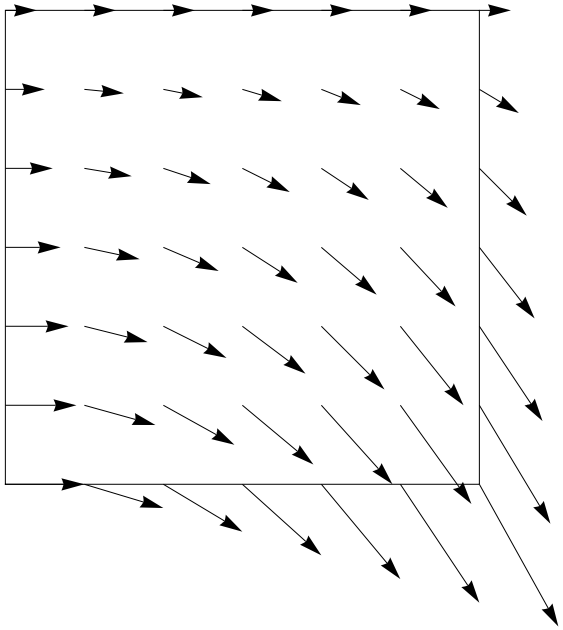
- Draw a $\boxed{\text{box}}$ around your final solution to the problem.
- Show your work. Demonstrate that you know how to get the correct answer, not just make a lucky guess.
- Clearly cross out any work that is incorrect.
- Each problem is worth 10 points.
- If you run out of room, continue your work on the back of the previous page. Make a note that you've done this, and make it clear where your work continues.

Do not write in this box
(1) _____
(2) _____
(3) _____
(4) _____
(5) _____
(6) _____
(7) _____
(8) _____
Total _____

(1) Find the largest and smallest values of $f(x, y, z) = z^2 - xy$ over the solid (filled in) sphere of radius 2. Use any techniques we learned in this class. Show all your work. To make this problem easier to grade, be sure to include a complete table of points you considered in your search in one clearly labeled location.

(2) Find the largest and smallest values of $f(x, y, z) = 2z + x^2 + y^2$ over the triangular surface with corners $(4, 0, 0)$, $(0, 4, 0)$, and $(0, 0, 4)$. Use any techniques we learned in this class. Show all your work. To make this problem easier to grade, be sure to include a complete table of points you considered in your search in one clearly labeled location.

(3) Shown below is a portion of a vector field. For each of the sides of the square, does that side contribute a positive, negative, or zero term to the circulation integral counterclockwise around the square and the flux integral out of the square?



Side	Contribution to Circulation	Contribution to Flux Integral
Top		
Left		
Right		
Bottom		

(4) The vector field $\vec{F}$ satisfies:

- $\nabla \cdot \vec{F}$ is constant 3.
- The flux of $\vec{F}$ upwards through the unit disk in the xy plane is π.
- The flux of $\vec{F}$ outwards through the unit cylinder (the unit circle for $z = 0$ to $z = 1$) is 4.

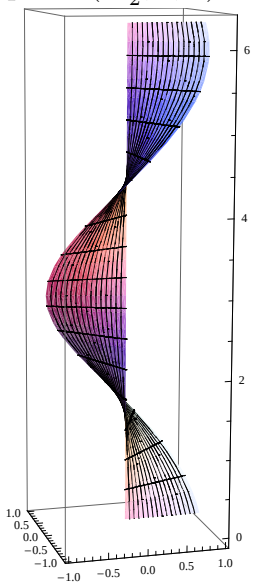
What is the flux of $\vec{F}$ upwards through the unit disk in the plane $z = 1$?

(5) Verify Stokes' Theorem for the vector field $\vec{F} = (x + xy, y^2, yz)$ over the top half of the surface of the sphere of radius 2. Show every step of your work.

(6) Use a quadratic approximation to approximate $1.01^{1.98}$. You may leave any arithmetic operations unevaluated. Irrelevant to the problem, but of note, is that your approximation will be less than 3 millionths off from the actual value.

(7) Is the vector field $\vec{F} = (yz, xz, xy)$ path independent?

(8) The helical surface shown below is parameterized by $\vec{r}(s,t) = (s\cos t, s\sin t, t)$ for $0 \le s \le 1$ and $0 \le t \le 2\pi$. Find the equation of a tangent plane to the surface at the point $(-\frac{1}{2}, 0, \pi)$.



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Name: _____ Netid: _____

Section (check which one applies):

☐ Discussion 1 (9:05am-9:55am)

☐ Discussion 2 (10:10am-11:00am)