Math 202 **Name (Print):** ______________________

Sparing 2019

Final

05/09/2019

Time Limit: 3 hours

This exam contains 8 pages (including this cover page) and 5 problems. Check to see if any pages are missing.

Statement of Ethics

I agree to complete this exam without unauthorized assistance from any person, materials, or device.

Signature ______________________ Date ______________________

1 Lin T 1:30-2:20 Shriver 104
2 Lin T 3:00-3:50 Hodson 301
3 Sherwood Th 4:30-5:20 Gilman 119
4 Sherwood Th 3:00-3:50 Maryland 309
5 Koh T 4:30-5:20 Gilman 119
6 Stubis Th 1:30-2:20 Hodson 313
7 Stubis Th 3:00-3:50 Hodson 301
8 VanBlargan T 3:00-3:50 Gilman 119

Your section number: ______________________

You are required to show your work on each problem on this exam. The following rules apply:

- **Organize your work**, in a reasonably neat and coherent way, in the space provided. Work scattered all over the page without a clear ordering will receive very little credit.
- **Mysterious or unsupported answers will not receive full credit**. A correct answer, unsupported by calculations, explanation, or algebraic work will receive no credit; an incorrect answer supported by substantially correct calculations and explanations might still receive partial credit.
- If you need more space, use the back of the pages; clearly indicate when you have done this.

Problem	Points	Score
1	20	
2	20	
3	20	
4	20	
5	20	
Total:	100	

Do not write in the table to the right.

1. (a) (5 points) (a) Find the equation of plane passing through the points $P = (2, 0, 0)$, $Q = (0, -1, 0)$, $R = (0, 0, 3)$. (b) Find the distance from the origin to this plane.

   (b) (5 points) $\int_0^1 \int_0^y \int_0^{x/\sqrt{3}} \frac{x}{x^2+z^2} dzdxdy$.
   A:$\frac{\pi}{12}$.

(c) (5 points) Calculate $\int_{\boldsymbol{c}}(x+y+z)ds$, where $\boldsymbol{c}$ is the helix $\boldsymbol{c}(t) = (\cos t, \sin t, t)$ for $0 \leq t \leq 3\pi$.
A: $2\sqrt{2} + \frac{9\sqrt{2}}{2}\pi^2$.

(d) (5 points) Let C be a closed curve that is the boundary of a surface S, calculate $\int_C (1,2,3)\cdot ds$.
A: 0.

2. (a) (10 points) Evaluate $\iint_S F \cdot dS$, where $F = (x, y, z)$, and S is the unit sphere $x^2 + y^2 + z^2 = 1$.

   A: 4π

   (b) (10 points) Let D be the unit disc, compute $\int_{\partial D} P dx$, where $P = \frac{y}{x^2+y^2}$, and ∂D is the oriented boundary of D.

3. (20 points) State Stoke's theorem (5 pts). Use Stoke's theorem to evaluate $\int_C \boldsymbol{F} \cdot ds$, where C is the triangle with vertices $(1,0,0)$, $(0,1,0)$, $(0,0,1)$ oriented counterclockwise when viewed from above and $\boldsymbol{F} = (x + y^2, y + z^2, z + x^2)$. (15 pts)

   A: -1.

4. (20 points) Let C^+ be the perimeter of the square $[0,1]\times[0,1]$ in the counterclockwise direction. Evaluate the line integral $\int_{C^+} x^2dx + xydy$.

5. (20 points) The intersection of the plane $x + \frac{1}{2}y + \frac{1}{3}z = 0$ with the unit sphere $x^2 + y^2 + z^2 = 1$ is a great circle. Use Lagrange Multipliers to find the point on this great circle with the greatest x-coordinate.

Please estimate your score.