M408M, Final Exam

Name: (please print)

Discussion Session Time: (please print the time)

Instructions: this is a 3 hours exam. Please, justify your answers and mark your answers clearly. If a problem seems hard, try another one. The order of the problems is not from easy to hard. All problems have equal value.

This section is for grading, please do not write in this area.

SCORES:

Problem 1:

Problem 2:

Problem 3:

Problem 4:

Problem 5:

Problem 6:

Problem 7:

Problem 8:

Problem 9:

Problem 10:

TOTAL:

1.(10 points) Write down the equation of the plane passing through the points $(3,-1,2),(8,2,4)$ **and** $(-1,-2,-3)$**.**

2. (10 points) Find the curvature of the curve given by the equation $\overline{r}(t) =< e^t cost, e^t sint, t >$ at the point $(1, 0, 0)$.

3. (10 points) Find the absolute maximum and minimum points of the function $f(x, y) = 2x^3 + y^4$**, defined on the domain** $D = \{(x, y) : x^2 + y^2 \leq 1\}$**.**

4. (10 points) Find the points on the surface $x^2y^2z^2 = 1$ that are closest to the origin.

5. (10 points) Evaluate the double integral $\int\int_D y^3 dxdy$, where D is the triangular region with vertices $(0, 2), (1, 1)$ and $(3, 2)$.

6. (10 points) Compute the volume of the solid lying under the paraboloid $z = x^2 + y^2$ and above the disk $x^2 + y^2 \leq 9$ in the xy-plane.

7. (10 points) Evaluate the integral $\int\int_D x dx dy$, where D is the region in the first quadrant that lies between the circles $x^2 + y^2 = 4$ and $x^2 + y^2 = 2x$.

8. (10 points) Find the mass and the center of mass of the lamina that occupies the region D bounded by $y = e^x, y = 0$ and $x = 1$ and has density function $\rho(x, y) = x$.

9. (10 points) We are given a lamina in the shape of an isosceles right triangle with equal sides of length a. Find the center of mass if the density at any point is proportional to the square of the distance from the vertex opposite the hypothenuse.

10. (10 points) Find the area of the surface $z = \frac{2}{3}(x^{3/2} + y^{3/2})$ **where** $0 \leq x \leq 1$ **and** $0 \leq y \leq 1$**.**