MAT 397, Spring 2003
FINAL EXAM

Name: _____ **(Please print)**

Instructor: Cox, Mori (9:35 or 12:50), Siagiova(8:30 or 12:50) **(Circle one)**

INSTRUCTIONS

- There are a total of 10 problems. It is your responsibility to make sure that all 10 are present.
- A scientific graphics calculator may be used on this final. However, a symbolic calculator, such as a TI-92, may **not** be used. All differentiation, integration, equation solving, etc. must be done by hand and written down on the exam.
- **Show all your work.** Minimal credit will be given for answers without supporting work.
- Please **simplify** your answers when appropriate.

#	Points	Score
1	(10)	
2	(10)	
3	(10)	
4	(10)	
5	(10)	
6	(10)	
7	(10)	
8	(10)	
9	(10)	
10	(10)	
Total	(100)	

1. Find an equation for the plane containing the points $P = (1, 2, 1)$, $Q = (4, 3, 3)$, $R = (2, 3, 2)$.

2. Find the point on the plane $x + 2y + z = 18$ that is also on the line that contains the points (1,2,1) and (3,-1,2).

3. Find the directional derivative of the function $f(x, y, z) = xye^{yz}$ at the point $P(2, 1, 0)$ in the direction of the vector $\mathbf{v} = 2\mathbf{i} - \mathbf{j} + 2\mathbf{k}$.

4. A particle's position at time t is given by $\mathbf{r}(t) = \cos(2t)\mathbf{i} + 3t\mathbf{j} - \sin(2t)\mathbf{k}$. Find the distance the particle travels between $t = 0$ and $t = 3$?

5. Find the equation of the plane tangent to the surface $x^2 + 2y^2 + xz = 4$ at the point (1,1,1).

6. Find all critical points of the function $f(x, y) = xy - y^2 - x^3$. Determine for each such point if it is a local maximum, local minimum or saddle point.

7. Use Lagrange multipliers to find the minimum value of $f(x, y, z) = 4x - 2y - 3z$ subject to $2x^2 + y^2 + z = 0$.

8. Write the following iterated integral as an equivalent iterated integral with the order of integration reversed. Do NOT evaluate the resulting integral.

$$\int_0^2 \int_5^{9-x^2} e^{x^2+y^2} dy dx$$

9. Evaluate $\iiint_S y\,dV$ where S is the solid in the first octant bounded by the parabolic cylinder $z = 4 - y^2$ and the planes $z = 0$, $y = x$, and $x = 0$.

10. Find the surface area of that portion of the paraboloid $z = 1 - x^2 - y^2$ that lies above the xy plane.