

MTH223. Spring 1995. EXAM II. Be Neat. Show work. Name _____.
All problems are worth 10 points.

- 1) Let $f(x, y) = x^2 y e^{xy}$. Compute $\nabla f(x, y)$.
- 2) Find the equation of the plane tangent to $z = x^4 + x y^3$ at $(-1, 2)$.
- 3) Find all relative maxima and relative minima for $f(x, y) = x^3 - 12xy + y^2 + 4$.
- 4) Suppose you want to solve the following problem: Find the absolute maximum for $f(x, y) = xy$ subject to the constraint $x^2 + y^2 = 4$. Either solve the problem or write a paragraph that describes the process you would use to solve this problem.
- 5) You need to find the absolute maximum of the function $f(x, y) = \ln(x - 1 + e^x)$ on the region $R = \{(x, y) : (x - 2)^2 + y^2 \leq 1\}$. How do you know this will be possible?
- 6) Given that $xyz - \cos(x^2 + y^2 + z^2) = 6$ implicitly defines z as a function of (x, y) , find a formula for $\frac{\partial z}{\partial x}$.
- 7) Evaluate $\int_0^2 \int_0^\infty x^2 y e^{xy^2} dy dx$
- 8) Set up an integral (or integrals), in terms of x and y , that you can use to find the volume of the solid bounded by $z = f(x, y)$ and the xy -plane over the region the region bounded by $y = x^2$ and $y = 6$.
- 9) Given $\int_{-1}^2 \int_{x^4}^{16} f(x, y) dy dx$. Set up the integral (or integrals) you would use if you have to change the order of integration in order to do the computation.
- 10) Given $\int_0^1 \int_0^{\sqrt{4-x^2}} f(x, y) dy dx$. Set up the integral (or integrals) you would use if you need to convert to polar coordinates to evaluate the integral.