MATH 223
Exam II

Name_____

1. Find the local minimum and maximum values and saddle points of the function $f(x, y) = x^4 + y^4 - 4xy + 1$.

2. Use Lagrange multipliers to find the minimum and maximum values of $f(x, y) = x^2 y$ subject to the constraint $x^2 + y^2 = 1$.

3. Find the extreme values of $f(x, y) = x^2 + 2y^2$ on the disk $x^2 + y^2 \leq 1$.

4. Find $\iint_D xcos(y)\, dA$ where D is bounded by $y = 1$ and $y = x^2$.

5. Evaluate $\iint_R (3x + 4y^2)\, dA$ where R is the region in the upper half-plane bounded by the circles $x^2 + y^2 = 1$ and $x^2 + y^2 = 4$.

6. Evaluate $\iiint_E xdv$ where E is bounded by the planes $x = 0,\ y = 0,\ z = 0,$ and $3x + 2y + z = 6$.

7. Use cylindrical coordinates to evaluate $\iiint_E (x^2 + y^2)\, dV$ where E is the region bounded by the cylinder $x^2 + y^2 = 4$ and the planes $z = -1$ and $z = 2$.

8. Use spherical coordinates to evaluate $\iiint_H (x^2 + y^2)\, dV$ where H is the hemispherical region that lies above the xy-plane and below the sphere $x^2 + y^2 + z^2 = 1$.

9. Evaluate $\iiint_E \sqrt{x^2+y^2+z^2}\, dV$ where E is bounded below by the cone $\phi = \frac{\pi}{6}$ and above by the sphere $\rho = 2$.

10. If $z = x^2 \sin y$, $x = s^2 + t^2$, and $y = zst$, find $\frac{\partial z}{\partial s}$ and $\frac{\partial z}{\partial t}$.