Name _____

Math 174, Exam 2 L. Brown
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Show all your work. Use backs of pages if necessary.

(12 pts) 1. Use Taylor's formula to find a quadratic approximation for f near the origin

$$f(x, y) = (\sin x)e^{2y}.$$

(15 pts) 2. Find all critical points of f and classify each as a local maximum, local minimum, or saddle point

$$f(x, y) = 2x^3 - 6xy + 3y^2.$$

(15 pts) 3. Find the maximum and minimum values of $x^2 + 2x + 2y^2$ on the region where $x^2 + y^2 \leq 4$.

(7 pts) 4. Find $\left(\frac{\partial w}{\partial x}\right)_y$ if $w = x^2 + y^2 + z^2$ and $xyz = 1$.

(16 pts) 5. Calculate the following integrals.
Hint: Consider reversing the order of integration.

a. $\int_0^1 \int_0^x y dy dx$

b. $\int_0^1 \int_x^1 2e^{y^2} dy dx$

(10 pts) 6. Set up an integral to determine the mass of a thin plane occupying the region in the first quadrant bounded by $y = 2 - x^2$ and $y = x^2$. The density is $\delta(x, y) = xy$. DO NOT EVALUATE the integral. Fill in the limits and integrand in the boxes provided.

$$M = \int_{\square}^{\square} \int_{\square}^{\square} \square \, dydx.$$

(10 pts) 7. Set up an integral in polar coordinates to determine the mass of a thin plane occupying the region in the first quadrant which is inside the curve $r = 2\sin 2\theta$ and outside the circle $r = 1$. The density is $\delta(x, y) = x$. DO NOT EVALUATE the integral. Fill in the limits and integrand in the boxes provided.

$$M = \int_{\square}^{\square} \int_{\square}^{\square} \square \, drd\theta.$$

(15 pts) 8. Set up an integral to determine the moment of inertia about the y–axis of a solid occupying the region bounded above by $z = x^2 + y^2 + 2$, below by $x + y - z = 0$, and on the sides by $x^2 + y^2 = 1$. The density is $\delta(x, y, z) = y^2$. DO NOT EVALUATE the integral. Fill in the limits and integrand in the boxes provided.

$$I_y = \int_{\square}^{\square} \int_{\square}^{\square} \int_{\square}^{\square} \square \, dzdydx.$$