7-26-11 Instr: Denis White Name ______________________

(%)

1. Consider the surface $x^4 + 3xz + z^2 + \cos(\pi xy) = -2$ and the point $P_0(-1, 1, 2)$ on that surface.

(16)

   (a) the tangent plane at P_0

   (b) the normal line to the surface atP_0.

2. Sketch the region of integration and write an equivalent double integral with the the order of integration reversed. Do NOT evaluate.

(10)

$$\int_1^e \int_0^{\ln x} x^2 y \, dy dx$$

3. Test the function $f(x, y) = 3xy - x^3 - y^3$ for local maxima, minima and saddle points.

(14)

4. Find the absolute maximum and minimum values of $f(x, y) = 2x^2 + y^2 - 4y$ on the closed triangular region R in the xy–plane, bounded by the lines $y = 4$, $y = x$ and $y = -x$. (Show all your work.)

(18)

5. Find the center of mass of a thin plate of constant density δ, bounded by the parabola $y = x^2$ and the line $y = 4$. (Suggestion: it should be obvious from your picture that $\overline{x} = 0$ by symmetry. It suffices to compute $\overline{y}$. Assume the mass is $32\delta/3$.)

(13)

6. Change the Cartesian integral to an equivalent polar integral. Then evaluate the polar integral

$$\int_0^2 \int_{-\sqrt{4-x^2}}^0 \frac{xe^{x^2+y^2}}{\sqrt{x^2+y^2}}\, dy\, dx$$

(13)

7. Set up but do not evaluate a (triple) iterated integral for the mass of the solid in the first octant bounded by the coordinate planes, the plane $z + y = 3$ and the cylinder $x^2 + y^2 = 4$ if the density is $\delta(x, y, z) = x$. Do NOT evaluate.

(16)