

Practice problems for the Final  
Math 126, Sections C, D  
Material covered after Midterm II

1. Find and classify critical points of the function

(a)  $f(x, y) = xy^2 - 2x^2 - y^2$

(b)  $f(x, y) = 3xy - x^2y - xy^2$

2. Find the points on the surface  $xy^2z^3 = 1$  which are closest to the origin.

3. (a) Reverse the order of integration and then evaluate the integral

$$\int_0^1 \int_{\sqrt{y}}^1 \sqrt{x^3 + 1} dx dy$$

- (b) Evaluate the following integral

$$\int_0^1 \int_{x^2}^1 x \sin(\pi y^2) dy dx$$

4. Find the volume of the solid bounded by the cylinder  $x^2 + y^2 = 1$  and the planes  $y = z$ ,  $x = 0$ ,  $z = 0$  in the first octant.

*Do this problem in two ways: using rectangular coordinates, and then using polar coordinates.*

5. Compute the volume of the solid bounded by the paraboloids  $z = x^2 + y^2$  from below and  $z = \frac{x^2}{2} + \frac{y^2}{2} + 1$  from above.

6. Evaluate the double integral

$$\iint_D (x^2 + x + y^2) dA$$

where  $D$  is the region

$$D = \{(x, y) : x^2 + y^2 \leq 4 \text{ and } y \geq x\}$$