

MATH 213 – 22 APRIL 2008 – EXAM 3

Answer each of the following questions. Show all work, as partial credit may be given.

1. (8 pts. each) Let $f(x, y) = x^2y^3 + 2x^4y$.
- (a) Find the linearization of the function $f(x, y)$ at the point $(1, 2)$.
 - (b) Use differentials to estimate the change in f when the point $(1, 2)$ moves to the point $(1.1, 2.3)$.

2. (12 pts.) Find all critical points of the function $f(x, y) = 4xy - x^4 - y^4$ and identify each as a local maximum, local minimum, or saddle point. (Hint: There are three critical points.)

3. (10 pts. each) Evaluate the following iterated integrals.

(a) $\int_1^2 \int_0^3 (x/y) \, dx \, dy$

(b) $\int_0^1 \int_x^{3-x} (x+y)^2 \, dy \, dx$

4. (10 pts. each) Reverse the order of integration in each of the following integrals. Do not evaluate. (Hint: It will be helpful to sketch the region before reversing the order.)

(a) $\int_0^1 \int_0^{x^2} x^2 \, dy \, dx$

(b) $\int_0^4 \int_{y/2}^2 x^2 \, dx \, dy$

5. (12 pts.) Find the centroid of the triangle bounded by the y -axis, the line $y = 3$ and the line $y = 2x$.

6. (10 pts. each)

(a) Evaluate the iterated integral $\int_0^3 \int_0^x y \, dy \, dx$.

- (b) Convert the integral of part (a) into a polar integral and evaluate.