

EXAM 3 REVIEW

MATH 2419 – SPRING 2008

1. Given a function, you should know how to find all the relative extrema and saddle points. Work the problems in Problem Set 8.
2. Given a function and a constraint, you should be able to use the method of Lagrange multipliers to find the critical points of the function subject to the constraint. Again, take a look at the problems in Problem Set 8.
3. Evaluate the iterated integral. Here, note that you need to first switch the order of integration.

$$\int_0^4 \int_{\sqrt{y}}^2 \cos(x^3) dx dy$$

4. Evaluate the iterated integral by converting to polar coordinates.

(a) $\int_{-\sqrt{2}}^0 \int_{-x}^{\sqrt{4-x^2}} 15xy^2 dy dx$

(b) $\int_0^{\sqrt{3}} \int_{\frac{1}{\sqrt{3}}y}^{\sqrt{4-y^2}} (x^2 + y^2)^{2008} dx dy$

5. (a) Evaluate $\iint_R 12xy dA$ where R is the region in the plane bounded by the graphs of

$$x - y^2 = 0 \quad \text{and} \quad x + y = 2$$

- (b) Although you would not do this in practice, reverse the order of integration that you used in part (a) and check that you get the same answer.

- (c) Evaluate $\iint_R e^{25-x^2-y^2} dA$ where R is the region in the second and third quadrants inside the circle $x^2 + y^2 = 25$ outside the circle $x^2 + y^2 = 9$ and above the line $y = x$.

6. Find the area of the surface given by $z = f(x, y)$ over the region R .

(a) $f(x, y) = 15 + 2x - 3y$ R : triangle with vertices $(0, 0)$, $(3, 0)$, $(3, 3)$

(b) $f(x, y) = xy \quad R = \{(x, y) : x^2 + y^2 \leq 16\}$

7. Determine whether the integral is convergent or divergent. Evaluate the integral if it converges.

(a) $\int_3^9 \frac{x}{(x^2 - 9)^{4/3}} dx$

(b) $\int_{-1}^{13} \frac{dx}{\sqrt[3]{2x + 1}}$

8. Determine whether the series is convergent or divergent. If the series converges, find its sum where possible. You should know in which situation you can find the actual sum.

(a) $\sum_{k=1}^{\infty} \frac{1}{\arctan k}$

(b) $\sum_{n=1}^{\infty} \frac{13n^5 - 11n^3 + 7}{23n^6 - 19n^4 + 17}$

(c) $\sum_{k=1}^{\infty} \frac{(-2)^{3k-1}}{(-3)^{2k+1}}$

(d) $\sum_{n=1}^{\infty} n^2 e^{-n^3}$

(e) $\sum_{k=1}^{\infty} \left(\frac{1}{4k+1} - \frac{1}{4k+9} \right)$

(f) $\sum_{k=1}^{\infty} \frac{\sqrt{k^3 + 1}}{k^3 - 2k^2 + 5}$

(g) $\sum_{n=1}^{\infty} \frac{3 + \cos n}{3^n}$

(h) $\sum_{k=1}^{\infty} (-1)^{k+1} \frac{5^{2k+1}}{3^{3k+3}}$

(i) $\sum_{k=2}^{\infty} \frac{1}{k \ln k}$

(j) $\sum_{n=2}^{\infty} \frac{n}{(\ln n)^2}$

(k) $\sum_{k=1}^{\infty} \frac{\sqrt{5k^6 + 3k + 21}}{7k^3 + 14k^2 + 93}$

(l) $\sum_{n=1}^{\infty} \frac{2n + 5}{\sqrt[3]{n^4 + n^2}}$

(m) $\sum_{n=0}^{\infty} \frac{(-5)^{n+2}}{2^{2n+1}}$

(n) $\sum_{n=2}^{\infty} \ln \left(\frac{3n^2 - 1}{2 + 2n^2} \right)$

(o) $\sum_{n=1}^{\infty} \frac{\pi + \arctan n}{\sqrt{n}}$

(p) $\sum_{n=1}^{\infty} \frac{3^n}{5^n + n}$

(q) $\sum_{k=1}^{\infty} \sec \left(\frac{3k + 1}{2 + k^2} \right)$

(r) $\sum_{n=1}^{\infty} \frac{n^4}{(n^2 - 2n - 1)^3}$

Date: April 23, 2008