
Math 16C Sec 2 (Malkin)
Mid-term exam 2
Fri May 30th 2008

Name:
Student ID:
Signature:

**DO NOT TURN OVER THIS PAGE
UNTIL INSTRUCTED TO DO SO!**

Write your name, student ID, and signature NOW!

**NO NOTES, CALCULATORS, OR BOOKS ARE ALLOWED.
NO ASSISTANCE FROM CLASSMATES IS ALLOWED.**

Read directions to each problem carefully. Show all work for full credit. In most cases, a correct answer with no supporting work will NOT receive full credit. Be organized and neat, and use notation appropriately. You will be graded on the proper use of derivative and integral notation.

Please write legibly!

#	Student's Score	Max. Score
1		7
2		10
3		15
4		6
5		5
6		7
Total		50

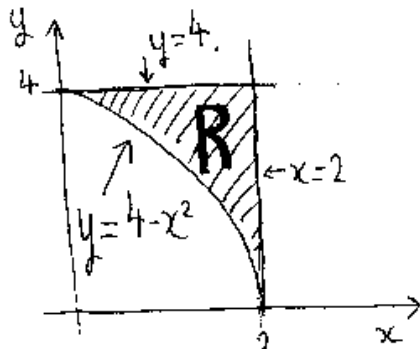
1. Consider the following integral:

$$\int_0^1 \int_{\sqrt{x}}^1 6x^2y \, dydx.$$

(a) (2 points) Sketch the region R over which we are integrating.

(b) (5 points) Evaluate the double integral.

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2. (a) (5 points) Write down the double integral expressing the area of the region R given in the diagram for **both** orders of integration. DO NOT EVALUATE THE INTEGRALS!



- (b) (3 points) Write down a double integral expressing the volume of the solid under the surface $z = f(x, y) = 3x^2y^3$ and above the triangular region R bounded by the curves $x = 0$, $y = 0$, and $x + y = 1$. DO NOT EVALUATE THE INTEGRAL!
- (c) (2 points) Write down a double integral expressing the *average value* of the function $f(x, y) = 2x^2 + y^2$ over the rectangular region R with vertices $(1, 1)$, $(3, 1)$, $(3, 2)$, and $(1, 2)$. DO NOT EVALUATE THE INTEGRAL!

3. (a) Determine the n th term (starting with $n = 1$) of each of the following sequences:

i. (2 points) 1, 2, 6, 24, 120, 720, 5040, ...

ii. (3 points) $-\frac{1}{1}, \frac{5}{4}, -\frac{9}{9}, \frac{13}{16}, -\frac{17}{25}, \frac{21}{36}, -\frac{25}{49}, \dots$

(b) Determine whether each series converges or diverges. You must justify your answer and state which test you are using.

i. (2 points) $\sum_{n=0}^{\infty} \frac{4}{3^n}$.

ii. (4 points) $\sum_{n=1}^{\infty} \frac{2n+1}{\sqrt{4n^2+3}}$.

iii. (4 points) $\sum_{n=1}^{\infty} \frac{2^n}{(n-1)!}$.

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4. (6 points) Find the radius of convergence and the interval of convergence of the following power series:

$$\sum_{n=0}^{\infty} \frac{n}{3^n} \cdot (x + 1)^n.$$

You do NOT need to say what happens at the end points of the interval.

5. (5 points) Suppose that a rubber ball, when dropped on a flat concrete surface, rebounds 90 percent of the distance it falls. Find the total vertical distance, both up and down, traveled by the ball if it is dropped from a height of 10 feet onto a flat concrete surface and allowed to bounce forever.

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6. (7 points) Use the method of Lagrange multipliers to minimize the function $f(x, y, z) = x^2 + 2y^2 + 3z^2$ subject to the constraint that $x - 4y + 3z = 12$.

END OF EXAM