Math 107 Fall '12 **Exam 1** **Score:** _____

Name: _____ **TA's Name:** _____

Instructions: You must show supporting work to receive full and partial credits. No text book, notes, formula sheets allowed.

1(13pts) Use the definition to determine if the improper integral converge: $\int_1^2 \frac{1}{x-1}dx$. (**Show all work.**)

2(12pts) Some values of a function $y = f(x)$ are given in the table below.

x	1	1.5	2	2.5	3
$f(x)$	1	2.25	4	6.25	9

(a) Use the right point sum with two partition, R_2, to approximate $\int_1^3 f(x)dx$.

(b) Use the midpoint sum, M_2, to approximate $\int_1^3 f(x)dx$.

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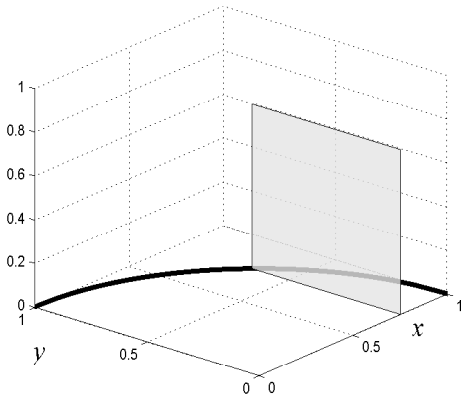
3(15pts) Let R be the region in the first quadrant that is bounded by two curves: $y = x^3$ and $y = x$. Sketch the region and set up a definite integral for its area. **Do not evaluate the integral.**

4(10pts) The base of a solid is a quarter disk bounded by $x^2 + y^2 = 1,\ x \geq 0, y \geq 0$. Each cross section of the solid that is perpendicular to the x-axis is a square as shown. Set up an integral for the volume of the solid. **Do not evaluate the integral.**



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5(10pts) Let $r = f(\theta) = \theta$ be the Archimedes spiral. Sketch the curve for $0 \leq \theta \leq \pi/2$ and set up an integral for the area of the region that is bounded by the spiral between $\theta = 0$ and $\theta = \pi/2$. **Do not evaluate the integral.**

6(15pts) A doughnut solid is obtained by rotating the unit disk bounded by $x^2 + y^2 = 1$ around the vertical line $x = 2$. Set up a definite integral for the volume of the doughnut. **Do not evaluate the integral.**

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7(15pts) Set up an integral for the length of the curve $y = x^2$ in the interval $0 \leq x \leq 1$. **Do not evaluate the integral.**

8(10pts) Use the Comparison Test to determine whether the improper integral converge or diverge: (Hint: Use $x \geq \sqrt{x}$ for $x \geq 1$. **Show all work.**)

$$\int_2^\infty \frac{x - \sqrt{x}}{x^2 - 1}\, dx$$

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2 point Bonus Question: The first day of this year's Fall is _____.