Midterm Exam #1 for Math 104-004, Fall 2016

Name (printed): _____

My signature below certifies that I have complied with the University of Pennsylvania's Code of Academic Integrity in completing this midterm examination.

Signature: _____ Date: _____

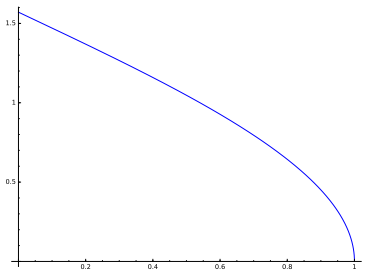
Problem	Points	Score
1	10	
2	10	
3	10	
4	10	
5	10	
Total	50	

- You have 50 minutes for this exam.
- On questions 1,2,3 and 4, we will award 0, 3, 6, 9 or 10 points (as mentioned on the canvas website).
- Please show **ALL** your work on this exam paper. Partial credit will be awarded where appropriate. Answers with little or no justification will get no credit.
- You may use both sides of one 8.5 by 11 inch sheet of notes.
- **NO** books, laptops, cell phones, calculators, or any other electronic devices may be used during the exam.
- No form of cheating will be tolerated. You are expected to uphold the Code of Academic Integrity.

1. Find the length of the curve on

$$y = \frac{2x^{5/2}}{5} + \frac{x^{-1/2}}{2}, \qquad 1 \leq x \leq 4.$$

2. The region bounded by the graph of $y = \arccos(x)$ in the first quadrant, $0 \leq x \leq 1$, is rotated about the x-axis to generate a solid.



(a) Setup the integral that computes the volume of the solid generated using the disc/washer method (You need NOT solve integral).

(b) Setup the integral that computes the volume of the solid generated using the shell method (You need NOT solve integral).

3. (10 points) The region in the first quadrant that is bounded above by $y = \frac{1}{x^{1/3}}$, on the left by the line $x = \frac{1}{8}$, and below by the line $y = 1$, is revolved about the line $y = 5$ to generate a solid. Find the volume of this solid.

4. (10 points) Find the centre of mass of a thin plate, with constant density $\delta = 1$, covering the region bounded by the parabola $x = y^2 - y$ and the line $y = x$.

5. (10 points) True or False.

(i) $\int_{-100}^{100} x^5 cos(x) = 0.$ _____

(ii) $\int_{-191}^{191} x^4 sin(x) = 691.$ _____

(iii) If $x = g(y) \geq 0$ is continuously differentiable on $[c, d]$, the area of the surface geenerated by revolving the graph of $x = g(y)$ about the y-axis is

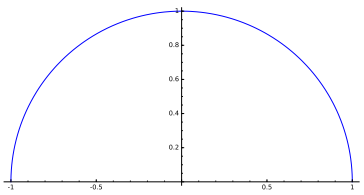
$$S = \int_c^d 2\pi g(y)\sqrt{1 + g'(y)^2}dy.$$ _____

(iv) If a plane region is revolved about a line in the plane that does not cut through the plane's interior, then the volume of the solid (say V) it generates is given by the following formula:

$$V = 2\pi dA,$$

Here, d is the distance from the axis of revolution to the centroid of the plane region.
A denotes the area of the plane region. _____

(v) The x-coordinate of the centroid of the semicircular region, of radius 1, given below is $\frac{4}{3\pi}$.



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