Math 112 Exam #1
Sept. 27, 2017

Time: 1 hour and 10 minutes
Instructions: Show all work for full credit. No outside materials or calculators allowed.
Extra Space: Use the backs of each sheet for extra space. Clearly label when doing so.

Name: _____

ID #: _____

Instructor/Section: _____

"I pledge by my honor that I have abided by the NJIT Academic Integrity Code."

_____ (Signature)

Problem	Value	Score
1	15 pts.	
2	15 pts.	
3	20 pts.	
4	15 pts.	
5	15 pts.	
6	20 pts.	
TOTAL	100	

1. Find the volume generated by rotating about x-axis the region in the x,y- plane bounded below and above, respectively, by the curves $y = x^2$ and $y = x$, and sketch the region. **(15 pts.)**

2. Let R in the x,y-plane be in the first quadrant and bounded by $y = x + 2$, $y = x^2$ and $x = 0$. Find the volume generated by revolving the region R about the line $x = 4$. **(15 pts.)**

3. Find the following: **(10 pts. each)**

(a) The arclength of the curve $y = \cosh x$, $0 \le x \le 1$, in the x,y-plane.

(b) The area of the surface generated by rotating the above curve around the x-axis.

4. A spring with a natural length of 15 cm exerts a force of 45 Newtons when stretched to a length of 20 cm. Assuming Hooke's law, find the work done in stretching the spring from 20 to 25 cm. **(15 pts.)**

5. Find the derivatives of the following functions: **(5 pts. each)**

(a) $y = \sqrt{\sinh^2 x + 1}$ (b) $y = \ln\left(\operatorname{sech}(\theta + 1)\right)$ (c) $y = 4t^3 \tanh\left(1/t^2\right)$.

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6. Evaluate the following integrals: **(5 pts. each)**

(a) $\int \left(\left(\coth \sqrt{x} \right) \Big/ \sqrt{x} \right) dx$ (b) $\int_0^{\pi/6} 2\cosh\left(\sin\theta\right)\cos\theta d\theta$ (c) $\int \coth(3x)dx$

(d) $\int \sinh(\cosh x)\sinh x dx$