Name: ______________________

Row: ______________________

Math 113H, Section 12
Exam 1

Instructor: David G. Wright

16-18 September 2010

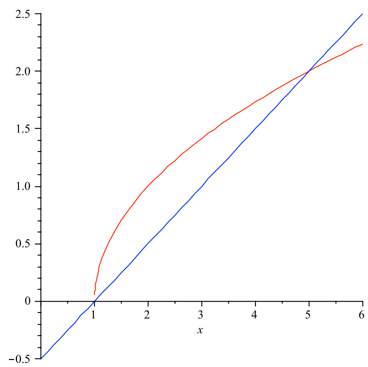
Instructions:

1. Work on scratch paper will not be graded.
2. Should you have need for more space than is allotted to answer a question, use the back of the page the problem is on and indicate this fact.
3. Simplify your answers. Expressions such as $\ln(1)$, e^0, $\sin(\pi/2)$, etc. must be simplified for full credit.
4. Calculators are not allowed.

For Instructor use only.

#	Possible	Earned		#	Possible	Earned
1.a	6			4	10	
1.b	6			5.a	8	
1.c	6			5.b	8	
1.d	6			5.c	8	
1.e	6			5.d	8	
2	10			5.3	8	
3	10			Total	100	

1. (30%) Consider the region between the curves $y = \sqrt{x-1}$ and $y = \dfrac{x-1}{2}$.



(a) Set up an integral for the area of the region bounded by the curves. DO NOT SIMPLIFY. DO NOT EVALUATE.

(b) Use the Washer Method to set up an integral for the volume when the region is rotated about the $x-$axis. DO NOT SIMPLIFY. DO NOT EVALUATE.

(c) Use the Shell Method to set up an integral for the volume when the region is rotated about the $y-axis$. DO NOT SIMPLIFY. DO NOT EVALUATE.

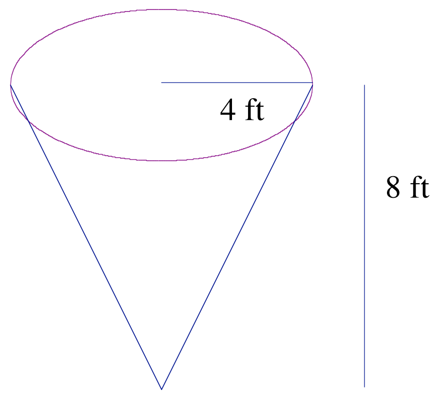
(d) Set up an integral for the volume when the region is rotated about the line $y = 2$. DO NOT SIMPLIFY. DO NOT EVALUATE.

(e) Set up an integral for the volume when the region is rotated about the line $x = -1$. DO NOT SIMPLIFY. DO NOT EVALUATE.

2. (10%) Use the disk method or the shell method to show that the volume V of a cone with radius r and height h is given by $V = \frac{1}{3}\pi r^2 h$.

3. (10%) A bucket that weighs 4 lb and a rope that weighs 0.2 lb per foot are used to draw water from a well that is 50 ft deep. The bucket is filled with 40 lb of water and is pulled up at a constant speed, but water leaks out of a hole in the bucket at a constant rate so that only half the water reaches the top. Find the work done in pulling the bucket to the top of the well.

4. (10%) A conical tank of radius 4 ft and height 8 ft is full of water of density 62.5 lbs per ft^3. Set up an integral that represents the work in foot pounds needed to pump the water to a height 2 ft above the top of the tank.



5. (40%) Evaluate the following integrals. Show your work.

   (a) $\displaystyle\int (\ln x)^2 \, dx$

   (b) $\displaystyle\int_0^{\pi/4} \cos^2(2x) \, dx$

(c) $\int t \cos t \; dt$

(d) $\int_0^{\pi/4} \sec^3 \theta \; d\theta$

(e) $\int \tan^2 x \sec^4 x \; dx$