Exam 1 Math 112 September 19, 2006

NAME_____

- No calculator is allowed. Leave your answers in fraction form. No decimal approximations needed.
- If you have any questions, please raise your hand and ask. The worst that will happen is that I will say, "I can't tell you."
- Do the problems that you find easiest first. Take deep breaths between questions.
- There are 100 points on this exam, and you have 110 minutes.
- I hope you all do well. Good luck!

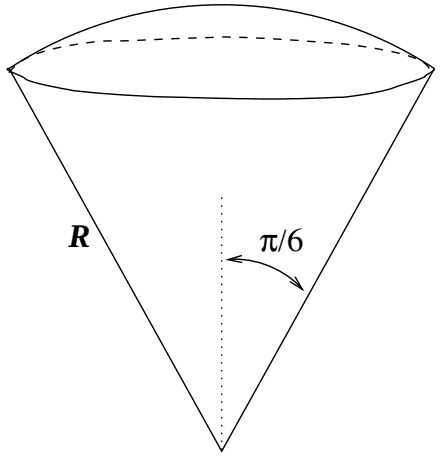
Question	Points	Points Earned
1a	10	
1b	8	
2	9	
3	9	
4	9	
5	7	
6	7	
7	7	
8	7	
9	7	
10	5	
11	5	
12	5	
13	5	
TOTAL	100	

1. Let $\mathcal{R}$ be the region bounded by the lines $y = x/2$, $y = -x/2 + 1$ and the x axis. Set up, but DO NOT EVALUATE, a **single integral** (not a sum of two or more integrals) for the volume of each of the solids described below.

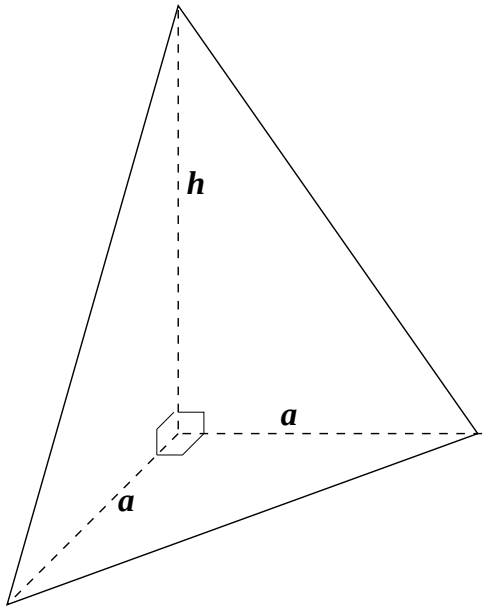
   (a) (10 pts) The volume is generated by revolving the region $\mathcal{R}$ about the line $x = 3$.

   (b) (8 pts) The volume is generated by revolving the region $\mathcal{R}$ about the x axis.

2. (9 pts) **Use the method of cylindrical shells** to set up (but DO NOT EVALUATE) an integral that gives the volume of the spherical cone shown below. The solid is a conical piece of a sphere with radius R. The angle between the central axis of the cone and the side of the cone is $\pi/6$.



3. (9 pts) Set up, but DO NOT EVALUATE, an integral that gives the volume of the solid shown below. The solid is a tetrahedron. The base is an isosceles right triangle; the two shorter sides of the base have length a. The base, back and left faces are mutually perpendicular. The height is h.



4. (9 pts) Set up but DO NOT EVALUATE an integral for the volume of the region between $y = 2x^2 + 2$ and $y = 3x + 4$ rotated about the line $y = -3$.

5. (7 pts) Reduce your answer completely, e.g. evaluate any functions appearing in your answer.

$$\int_0^1 \frac{2}{\sqrt{4 - t^2}}\, dt$$

6. (7 pts) $\int \frac{e^x}{1+4e^{2x}}\,dx$

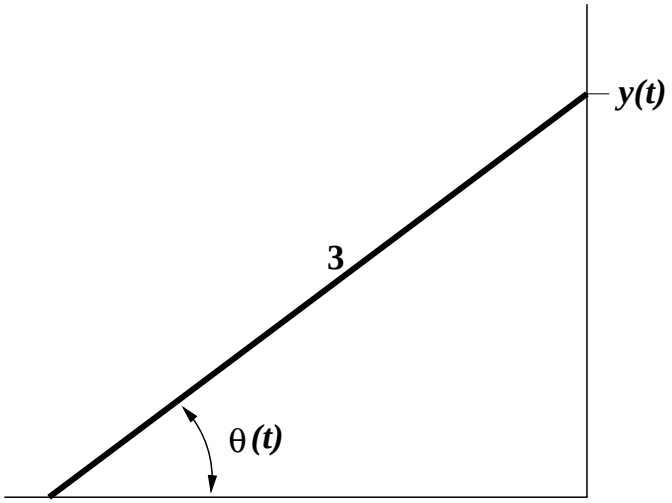
7. (7 pts) $\int \frac{e^{2x}}{1+4e^{2x}}\,dx$

8. (7 pts) $\int_1^2 \frac{9t^5}{\sqrt{t^3+8}}\,dt$

9. (7 pts) $\int \frac{6x}{(x^2+1)\ln(x^2+1)}\,dx$

10. (5 pts) Evaluate $\arcsin\left(-\frac{1}{2}\right)$:

11. (5 pts) A rod of length 3 meters leans against a wall, as shown here:



The rod is sliding down the wall; the height of the right end of the rod is

$$y(t) = 2 - t^2.$$

Find $\theta'(t)$. (Be sure your answer is a function of t only.)

12. (5 pts) Evaluate $\sec\left(\sin^{-1}\left(-\frac{\sqrt{2}}{2}\right)\right)$:

13. (5 pts) Simplify the following to an expression without trig or inverse trig functions.
$\tan\left(\sin^{-1}\left(\frac{3}{x}\right)\right)$