Your Name

Your Signature

Student ID #

Quiz Section

Professor's Name

TA's Name

- Turn off and stow away all cell phones, watches, pagers, music players, and other similar devices.
- This exam is closed book. You may use one $8.5'' \times 11''$ sheet of handwritten notes (both sides OK). Do not share notes.
- You can use only a Texas Instruments TI-30X IIS calculator. No other models are allowed.
- In order to receive credit, you must **show all of your work**. If you do not indicate the way in which you solved a problem, or if the work shown is incorrect or incomplete, you may get little or no credit for it, even if your answer is correct.
- You may use directly the integral formulas # 1-18 in the table from section 7.5 of your textbook (posted on the departmental math 125 website), without deriving them. **Show your work in evaluating any other integrals, even if they are on your note sheet**.
- Place a box around your answer to each question. Unless otherwise instructed, simplify your answers, but leave them in exact form (for example $\frac{\pi}{3}$ or $5\sqrt{3}$).
- If you need more room, use the backs of the pages and indicate that you have done so.
- This exam has 8 pages, in addition to this cover sheet. Make sure you have a complete exam.

Question	Points	Score
1	14	
2	14	
3	10	
4	14	
5	14	

Question	Points	Score
6	10	
7	10	
8	14	
Total	100	

1. (14 points) Evaluate the following integrals. Show your work. Simplify and box your answers.

   (a) $\int \sqrt{x}\ln(\sqrt{x})dx$

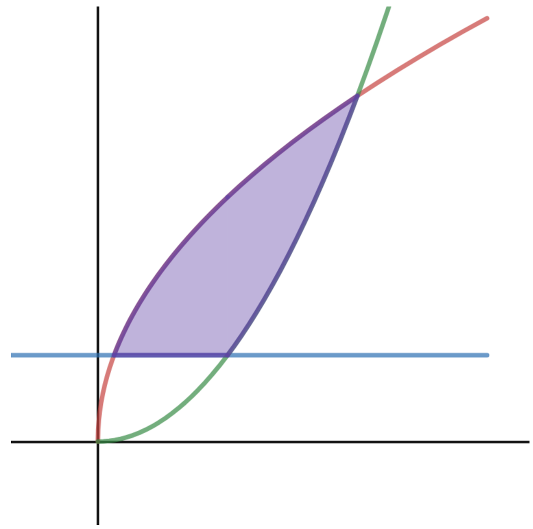
   (b) $\int \frac{1}{x^4\sqrt{x^2-4}}dx$

2. (14 points) Evaluate the following integrals. Show your work. Simplify and box your answers.

(a) $\int_0^{\pi/4} \frac{\sin^4\theta}{\cos^6\theta}\,d\theta$

(b) $\int_0^{1/2} \frac{\sqrt{2x}}{2x-4}\,dx$

3. (10 points) Compute the area of the region that is bounded above by $y = \sqrt{8x}$ and below by the line $y = 1$ and the curve $y = x^2$. Simplify and box your answer.



4. (14 points) One model for air resistance predicts that a particular ball thrown straight up in the air will have velocity at t seconds given by:

$$v(t) = ce^{-t} - 10 \text{ meters/sec, for some constant } c,$$

where upward is considered positive velocity. Assume the ball is thrown straight upward starting from the ground with an initial velocity of 20 m/s.

(a) Find the formula for the height $h(t)$ of the ball after t seconds.

(b) Find the **total distance** traveled by the ball from $t = 0$ to $t = 2$ seconds. You may give your final answer as a decimal accurate to 3 digits after the decimal point (or leave in exact form).

5. (14 points) A particle is sliding down the curve $y = 10 - x^3$. At time $t = 0$ the particle starts at $(0, 10)$. The x-coordinate of the particle at time t is $x(t) = \frac{t}{3}$. Time is measured in seconds, distance in meters. Let $a(t)$ denote the arclength distance traveled by the particle along the curve in the first t seconds.

   (a) Set up an integral expression equal to $a(t)$. Do NOT attempt to evaluate it.

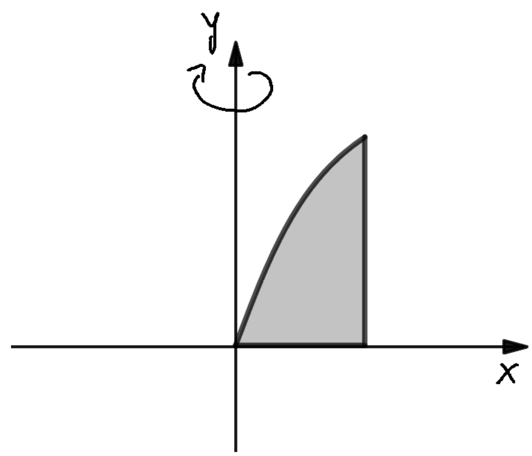
   (b) Calculate $a'(1)$. Include units.

   (c) Use Simpson's Rule with $n = 4$ subdivisions to approximate the value of $a(1)$.
   Show work, and give your answer correct to 3 decimal places.

6. (10 points) Let $\mathcal{R}$ be the region in the first quadrant bounded by:

$$\text{the } x\text{-axis, the curve } y = 3\arctan(x) \text{ and the line } x = \sqrt{3}.$$

Calculate the volume of the solid of revolution generated by rotating $\mathcal{R}$ about the y-axis.



7. (10 points) Find the solution to the differential equation

$$\pi \frac{dy}{dx} = \frac{e^{x-y}}{\sqrt{4-e^{2x}}}$$

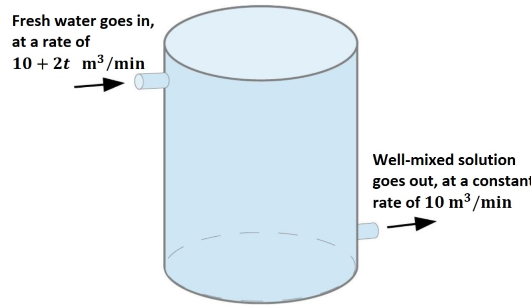
that satisfies the initial condition $y(0) = 0$. Give your solution in explicit form, $y = f(x)$.

8. (14 points) At time $t = 0$ minutes a tank holds an initial volume $V_0 = 100$ m^3 of salty water, with an initial amount $S_0 = 3$ kg of salt dissolved in it.

   Fresh water enters the tank at a rate of $10 + 2t$ m^3 per minute, where t is the time in minutes.

   The salt always remains uniformly mixed throughout the water solution in the tank, and the solution exits the tank at a constant rate of 10 m^3/min.

   (a) Find a formula for the volume $V(t)$ of salty water solution in the tank at time t minutes.



   (b) Set up a differential equation for $S(t)$, which is the amount (in kg) of salt in the tank at t min. Do not solve it yet.

   (c) Solve the differential equation in part (b) to find a formula for $S(t)$.

   (d) How much salt is left in the tank after 10 min? Leave your answer in exact form.