

Your Name

Your Signature

Student ID #

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Quiz Section

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Professor's Name

TA's Name

- This exam is closed book. You may use one $8\frac{1}{2}'' \times 11''$ sheet of handwritten notes (both sides). Do not share notes.
- Give your answers in exact form, except as noted in particular problems.
- Graphing calculators are not 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, you may get little or no credit for it, even if your answer is correct. You may use any of the 20 integrals from the table on p. 506 of the text 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.
- If you need more room, use the backs of the pages and indicate that you have done so.
- Raise your hand if you have a question.
- This exam has 10 pages, plus this cover sheet. Please make sure that your exam is complete.

Question	Points	Score
1	16	
2	8	
3	8	
4	8	
5	8	
6	12	

Question	Points	Score
7	10	
8	8	
9	10	
10	12	
Total	100	

1. (16 total points) Evaluate the following integrals.

(a) (8 points) $\int x \arcsin x \, dx$

(b) (8 points) $\int \sin^4(3t) \cos^3(3t) \, dt$

2. (8 points) Evaluate the integral

$$\int_{e^2}^{e^3} \frac{(\ln x)^3 + 1}{x((\ln x)^3 - (\ln x)^2)} dx.$$

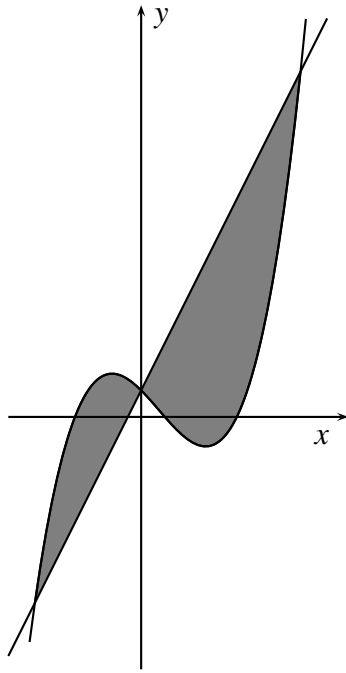
3. (8 points) Evaluate the integral

$$\int_1^{\infty} \frac{\sin(1/x)}{x^2} dx.$$

If this integral does not converge, explain why.

4. (8 points) Let $f(x) = \cos(x^2)$. Find the average value of $f'(x)$ on $[0, \sqrt{\pi}]$.

5. (8 points) Find the area of the shaded region between the curves $y = x^3 - x^2 - 2x + 1$ and $y = 4x + 1$, as shown below.



6. (12 total points) Let R be the region bounded by the curves $y = x^2$, $y = \sin(\pi x/2)$, $x = 0$, and $x = 1$.
- (a) (8 points) Find the volume of the solid obtained by rotating R around the y -axis.

- (b) (4 points) Set up, BUT DO NOT EVALUATE, an integral to compute the volume of the solid obtained by rotating R about the horizontal line $y = -2$.

7. (10 points) An 8 foot chain weighs 120 pounds. A large robot is holding one end of the chain 3 feet above the ground, so that 5 feet of the chain are on the ground. How much work must the robot do to lift this end of the chain from a height of 3 feet to a height of 10 feet?

8. (8 points) The odometer on your car is broken. However, you occasionally checked the speedometer during an 8 hour trip and obtained the data below. Use the trapezoidal rule to estimate the distance traveled.

time (in hours)	0	2	4	6	8
speed (in mph)	50	58	66	62	61

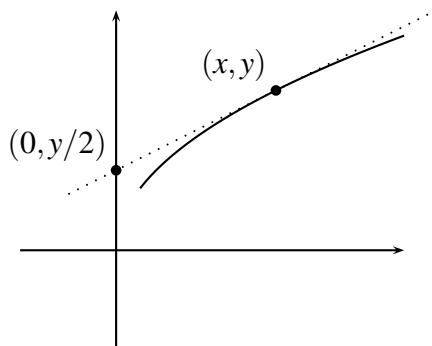
9. (10 total points) Consider the region bounded by $x = 1$, $x = 10$, $y = \frac{1}{x}$, and $y = \frac{1}{2x}$.

(a) (8 points) Find the centroid of this region.

(b) (2 points) Determine whether the centroid lies inside the region.

10. (12 total points) A curve has the property that the tangent line to the curve at each point (x,y) has y -intercept $(0,y/2)$, as shown in the picture below. In addition, the curve passes through the point $(3,1)$.

(a) (4 points) Derive a differential equation for the curve using its slope at the point (x,y) .



- (b) (8 points) Solve the differential equation you obtained in part (a) to determine the equation of the curve.