

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 notes.
- Give your answers in exact form. Do not give decimal approximations.
- Graphing calculators are not allowed. Do not share notes.
- In order to receive credit, you must show your work. Do not do computations in your head. Instead, write them out on the exam paper.
- Place a box around **YOUR FINAL ANSWER** to each question.
- If you need more room, use the backs of the pages and indicate to the reader that you have done so.
- Raise your hand if you have a question.

Problem	Total Points	Score
1	14	
2	14	
3	8	
4	8	
5	10	
6	6	

Problem	Total Points	Score
7	6	
8	10	
9	8	
10	8	
11	8	
Total	100	

1. [14 points total] Evaluate the following indefinite integrals.

(a) [7 points] $\int \frac{x^2 + 1}{x^2 - 2x - 3} dx$

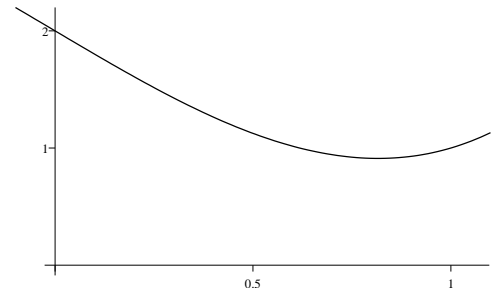
(b) [7 points] $\int y^2 (\ln y)^2 dy$

2. [14 points total] Evaluate the following definite integrals.

(a) [7 points] $\int_0^4 e^{\sqrt{2t+1}} dt$

(b) [7 points] $\int_0^\pi \sin^3 \theta \cos^2 \theta d\theta$

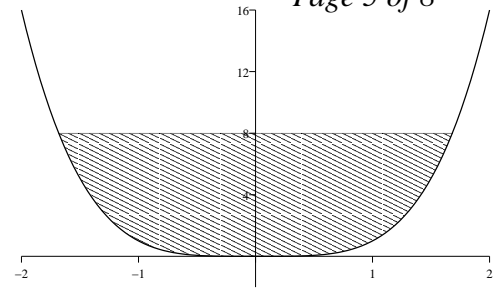
3. [8 points] Consider the area bounded by the curves $y = x^3 - 2x + 2$, $x = 0$, $x = 1$, and $y = 0$. Find the volume swept out by rotating this area about the y -axis.



4. [8 points] A particle moves along a line with acceleration $a(t) = \frac{1}{2\sqrt{t}}$ measured in m/sec^2 . It has a velocity of -2 m/sec at time $t = 0$. Find the total distance traveled by the particle during the time interval $0 \leq t \leq 9$.

5. [10 points] Determine whether the integral $\int_0^{\infty} \frac{1}{(x^2 + 2x + 2)^{3/2}} dx$ is convergent or divergent. If it converges, evaluate it.

6. [6 points] The portion of the graph of $y = x^4$ between $x = 0$ and $x = 2$ is rotated around the y -axis to form a container with depth of 16 meters. The container is filled with water up to the level of 8 meters. Find the integral that gives the work required to pump all the water out over the side. DO NOT EVALUATE THE INTEGRAL. Distance is measured in meters, the density of water is 1000kg/m^3 and the acceleration due to gravity is 9.8m/sec^2 .



7. [6 points] Find the derivative of $F(x) = \int_x^{\tan x} \frac{e^{t^2+1}}{t^2+1} dt$.

8. [10 points] A hot cube of metal is removed from an oven and left to stand in a cold room. The cube is losing heat in such a way that the rate of change of its temperature is proportional to the difference between the temperature of the metal and the temperature of the room. Suppose that the room has a constant temperature of 47° F. Initially the cube's temperature is 443° F. Ten minutes after being removed from the oven, the cube's temperature is 380° F. What will the cube's temperature be 20 minutes after being removed from the oven?

9. [8 points] Consider the region bounded by $y = x^k$, $x = 1$ and the x -axis. Here $k > 0$ is some fixed number. If the centroid of this region lies on the line $y = 0.26$, what is the value of k ?

10. [8 points] Find the solution to $y' = \frac{\ln x}{xy}$, with $y(1) = 2$.

11. [8 points total] Let $f(x) = e^{x^2}$.

(a) [4 points] Write down an integral formula for the arclength of the curve $y = f(x)$, for $0 \leq x \leq 3$.
DO NOT EVALUATE THE INTEGRAL.

(b) [4 points] Use Simpson's Rule with $n = 6$ to find an approximate value for the integral in part (a).
Show clearly what you are doing. Give your answer in exact form (not a decimal approximation).