

175 §2- CALCULUS II - Midterm 2

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You can keep this page if you want. Answer on your blue book. Indicate clearly in each page the question you are working on. Make sure to show all your work. Do not skip any non-obvious steps. Just the right answer does not count. Some computations and then an unjustified jump to the right answer, is not sufficient, and will only receive partial credit, the same as if only the computations had been given without the final answer. Numerical approximations (as provided, for example, by a calculator) are not acceptable, except of course for the last question.

Among other skills, this exam expects to assess the following Core Outcomes:

- Apply and evaluate a variety of strategies for solving a problem. / Interpret written materials. (E.g., question 1.)
- Write clearly for specific purposes and audiences. (E.g., questions 2, 3 but, really, this applies to all questions.)
- Demonstrate an understanding of the essential concepts underlying theories in the field. / Apply theories to typical problems in the field. (E.g., question 4.)
- Demonstrate an understanding of the basic methods of inquiry used in this field. (E.g., question 3.)
- Apply theories to typical problems in the field. (E.g., question 2.)

1. (5 pt) Find the volume of the solid obtained by rotating about the y -axis the region between the x -axis and the curve $y = \sec^2 x$ for $0 \leq x \leq \pi/4$.

2. (5 pt) Solve the initial value problem $(t^2 + 3t + 3)\frac{dx}{dt} = 1$, $x(3) = 0$.

3. (5 pt) Find $\int \frac{x^3 + 5}{x^4 - x^2} dx$.

4. (5 pt) We have that $\int_0^1 \frac{4}{1+t^2} dt = \pi$. Suppose we do not know the value of π . We can use the trapezoidal rule to approximate it. Find a value of n such that the theoretical error for the trapezoidal rule using n subdivisions is strictly smaller than $1/10$. Find the approximation given by the trapezoidal rule using this n .

(Since we actually know the value of π , you should be able to check that the number you obtain is indeed within $1/10$ of the right answer.)