Math 112z, Fall 2019 Practice Midterm 1

Name: .

Student ID Number: _

- There are 7 pages of questions. Make sure your exam contains all these questions.
- This is a closed book, closed note, no calculator exam. You must show your work on all problems. The correct answer with no supporting work may result in no credit.
- Put a box around your FINAL ANSWER for each problem and cross out any work that you don't want to be graded.
- If you need more room, use the backs of the pages and indicate clearly that you have done so.
- Raise your hand if you have a question.
- Remember the **Honor Code**. Avoid suspicion of cheating by keeping your eyes on your paper and clearly showing your work on each problem!
- The problems are not ordered according to their difficulties, so please take a look at all problems and do not waste too much time on one problem. Budget your time wisely.
- You have 75 minutes to complete the exam.

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GOOD LUCK!

(a)
$$\int x^2 \cos 5x dx$$

(b) $\int \tan^5 x dx$

2. (15 pts) Evaluate the following integral

$$\int \frac{x^3 + 4x + 3}{x^4 + 5x^2 + 4} dx$$

3. (15 pts) Evaluate the integral

$$\int \frac{\sqrt{x^2 - 9}}{x^3} dx$$

4. (10 pts) Consider the curve

$$36y^2 = (x^2 - 4)^3, \quad y \ge 0$$

Find the length of the curve between $P_0(2,0)$ and $P_1(3,\sqrt{125}/6)$

5. (10 pts) Use the Comparison Theorem to determine whether

$$\int_0^\infty \frac{x}{x^3 + 10} dx$$

is convergent or divergent.

6. (15 pts) Determine whether the following improper integrals are convergent or divergent.

(a)
$$\int_{-2}^{3} \frac{1}{x^{10}} dx$$

(b)
$$\int_0^\infty \sin^2 t dt$$

$$\int_{-\pi}^{\pi} \sin(mx) \cos(nx) dx$$

where m, n are positive integers. Evaluate the integral without using product to sum formula. (Hint: The m = n case is simple. For $m \neq n$, use integration by parts.)