

MATH 123 PRACTICE MIDTERM 1

NAME (PRINTED):

DISCUSSION TIME:

Please *turn off all electronic devices*. You may use both sides of a 8.5×11 sheet of paper for notes while you take this exam. No calculators, no course notes, no books, no help from your neighbors. **Show all work**—the grading will be based on your work shown as well as the end result. Remember to put your name at the top of this page. Good luck.

Problem	Score (out of)
1	(10)
2	(10)
3	(10)
4	(10)
5	(10)
6	(10)
7	(10)
Total	(70)

1. (10 pts) Evaluate the following integral

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

2. (10 pts) Evaluate the following integral

$$\int \frac{x^4}{(x+1)^2(x^2+1)} dx$$

3. (10 pts) Evaluate the following integral

$$\int \frac{1}{(1-x^2)^{\frac{3}{2}}} dx$$

4. (10 pts) Evaluate the following improper integral. To earn full credit, you must correctly use limits in your answer.

$$\int_{-\infty}^{\infty} \frac{(\tan^{-1}(x))^2}{x^2 + 1} dx$$

5. Does the following integral converge or diverge. Carefully justify your answer using inequalities and citing relevant theorems.

$$\int_0^1 \frac{\tan^{-1}(x)}{x^{\frac{1}{3}}} dx$$

6. (10 pts) Find the volume of the solid obtained by rotating the region bounded by the circle of radius 1 centered at $(2, 0)$ about the y -axis.

7. (10 pts) Find the volume of the solid obtained by rotating the region bounded by $y = x^2$, $y = -\sqrt{x} + 2$ and the x-axis about the x-axis.