

MATH 122
Practice Exam 2

Joanna Bieri

Name: _____

Instructions:

1. Print your name on this page in the space provided.
2. **You must CIRCLE your FINAL answer for full credit.**
3. Show all work, **write down the formulas used and explain in words what you are doing**, partial credit will be given for written work only. **Answers with no work will NOT be given full credit. Neatness counts.**
4. Use of notes, books, or calculators is NOT ALLOWED.
5. You may have one sheet of paper for notes and formulas.
6. Good luck!

Important Ideas on this exam:

1. General Integration Methods: Substitution, Integration by Parts, Trigonometric Substitution, Algebraic Simplification, Powers of $\sin(x)$ and $\cos(x)$
2. Numerical Integration - Approximations and Error
3. Finding Area and Volume using Integration.
4. Volumes of Revolution.
5. Applications to Physics: Mass, Work, and Pressure.

Score	
1	/30
2	/10
3	/10
4	/10
5	/10
6	/10
7	/10
8	/10
Total	/100

Problem 1 (30 points)

Complete the square and solve the resulting integral.

$$\int \frac{1}{y^2 + 2y + 5} dy$$

[HINT: You will need to use a trigonometric substitution to evaluate the integral, make sure to draw your triangle]

Evaluate the following integrals using integration by parts.

$$\int x \ln(x) dx$$

Evaluate the following integral using substitution.

$$\int_0^1 \frac{\cos(x)}{1 - \sin(x)} dx$$

Problem 2 (10 points)

Evaluate the following improper integral.

$$\int_1^3 \frac{1}{(x-2)^2} dx$$

Problem 3 (10 points)

Evaluate the following indefinite integral using the method of your choice. You must state what method you are using!

$$\int \frac{\cos(x)}{1 + \sin(x)} dx$$

Evaluate the following definite integral using the method of your choice. You must state what method you are using!

$$\int_0^1 te^{2t} dt$$

Problem 4 (10 points)

Sketch the function $f(x) = -x^3 + 2$, then answer the following questions:

- a. How would you use RIGHT(5) to evaluate $\int_0^1 f(x) dx$? Sketch RIGHT(5) on your graph of $f(x)$.
- b. Would RIGHT(5) be an underestimate or overestimate of the value of the integral?
- c. How would you find MID(5)? (Just say in words what you would have to do.)

Problem 5 (10 points)

Draw the area bounded by the curves $3x + y = 6$ and $y = x^2 - 4$, then use integration to find the value for the area bounded by the two curves.

Problem 6 (10 points)

Find the volume of the solid generated by rotating the region bounded by $y = x^2$, $y = 0$, $y = 1$ about the line $y = -2$.

Problem 7 (10 points)

A 10 meter uniform chain with a mass of 5 kilograms per meter is dangling from the roof of a building. How much work is needed to pull the chain up onto the top of the building? (acceleration of gravity: $9.8 \frac{m}{s^2}$)

Problem 8 (10 points)

Find the mass of the region bounded by $y = \sin(x)$ and $y = 0$ between $x = 0$ and $x = \pi$, if the density is $\delta(x) = x \frac{g}{cm^2}$.