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	/10
2	/10
3	/10
4	/10
5	/10
6	/10
7	/10
8	/10
9	/10
10	/10
Total	/100

Problem 1 (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? Bound the error in RIGHT(5)

c. How would you find MID(5)? Bound the error in MID(5)

Problem 2 (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 3 (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 4 (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 5 (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 $\delta(x) = x\frac{g}{cm^2}$.

Problem 6 (10 points)

Sketch the function $f(x) = -x^2 + 4$, then answer the following questions:

a. How would you use LEFT(5) to evaluate $\int_0^1 f(x)\ dx$? Sketch MID(5) on your graph of $f(x)$.

b. Would LEFT(5) be an underestimate or overestimate of the value of the integral?

c. Write down the expression that you would solve to find the the number of points necessary to use LEFT(n) to approximate the integral to within an error tolerance of 10^{-2}.

Problem 7 (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 8 (10 points)

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

Problem 9 (10 points)

A rectangular water tank has length 20m, width 10m, and depth 15m. If the tank is full, how much work does it take to pump all the water out? (density of water: $1000\frac{kg}{m^3}$)

Problem 10 (10 points)

Find the mass of the solid created by rotating the region bounded by $y = x$, $y = x^2$ about the x-axis, if the density is $\delta(x) = x + 1\frac{kg}{m^3}$.