Name:_____

Student ID:_____

Section:_____

Instructor:_____

Math 2413 (Calculus I)
Final Exam Practice

Instructions:

- Work on scratch paper will not be graded.
- Show all your work in the space provided. Full credit will be given only if the necessary work is shown justifying your answer.
- **Please write neatly. If I cannot read your handwriting, you will not receive credit.**
- Simplify your answers as much as possible. Expressions such as $\ln(1)$, e^0, $\sin(\pi/2)$, etc. must be simplified for full credit.

Show all work in the space provided. Full credit will be given only if all steps are shown justifying your answer. Please write neatly and carefully, if I cannot read your handwriting, you will receive NO credit.

1. (10 points) Use implicit differentiation to find $\dfrac{dy}{dx}$.

$$7xy^3 + 4x^3y = 1.$$

2. (10 points) Find the absolute maximum and minimum of the function on the closed interval $[-1, 1]$

$$f(x) = 3x^{2/3} - 2x.$$

3. (10 points) Determine the intervals on which the graph is concave down or concave up. You must include the sign chart:

$$f(x) = 5x + \frac{8}{\sin x}, -\pi < x < \pi.$$

4. (10 points) Find the given limit using L'Hopital Rule:

   (a) $\lim_{x \to 0} \frac{7x + e^x - e^{8x}}{1 - \cos(3x)}$.

   (b) $\lim_{x \to 1^+} (\ln(x))^{x-1}$.

5. (10 points) Find the antiderivative:

   (a) $\int \sqrt[5]{x^3}dx.$

   (b) $\int \frac{(4+\sqrt{x})^2}{x}dx.$

6. (10 points) Find the left endpoints approximation L_4 and the right endpoints approximation R_4 for the function

$$f(x) = \cos^2(x) \text{ on } [\frac{\pi}{8}, \frac{\pi}{2}].$$

7. (10 points) Given that $\int_0^4 f(x) = 9$, $\int_0^2 f(x) = -7$, $\int_0^4 g(x) = -1$and $\int_0^2 g(x)dx = 4$. Find

$$\int_0^2 (2f(x) - 3g(x))dx.$$

8. (10 points)

(a) Let $F(x) = \int_1^{e^x} \ln(u^2)du$. Find $F'(x)$.

(b) Evaluate the definite integral $\int_0^1 \frac{x^2 - 5}{1 + x^2}dx$.

9. (10 points)

(a) Find the integral $\int t^4 cos^2(t^5)\sin(t^5)dt$.

(b) Find the integral $\int \cos(\theta)(1-\cos(\theta))^{99}\sin(\theta)d\theta$.

10. (10 points) Find a such that the line $x = a$ divides the region bounded by the graphs of $y^2 = 16 - x$ and $x = 0$ into two regions of equal area.

END OF EXAM