

College of the Redwoods  
Mathematics Department

Math 50B — Integral Calculus  
Makeup Exam #4

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### Quiz Questions

**Read Carefully!** You have until the end of the class period to complete the exam. Place the solution to each exercise on a separate sheet of paper. When finished, arrange your solutions in order, place these exam page(s) on top of your solutions, and staple. Good luck!

**Important Notice:** You are not allowed to use calculators on this exam. The exam is closed book, closed notes, closed resource book.

EXERCISE 1. Find the following indefinite integral.

$$\int x^3 e^{-x} dx$$

EXERCISE 2. Use trigonometric substitution to find the following indefinite integral.

$$\int \frac{dx}{x^2 \sqrt{4-x^2}}$$

EXERCISE 3. Use partial fraction decomposition to find the following indefinite integral.

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

EXERCISE 4. If  $f(t)$  is continuous for  $t \geq 0$ , the *Laplace Transform* of  $f$  is the function  $F$  defined by

$$F(s) = \int_0^{\infty} f(t) e^{-st} dt.$$

Given  $f(t) = e^{-2t}$ , find the Laplace Transform of  $f(t)$ . What is the domain of the Laplace Transform  $F(s)$ ? That is, for what values of  $s$  does the integral converge?.

EXERCISE 5. Consider the function

$$f(x) = \frac{x^5}{6} + \frac{1}{10x^3}.$$

Find the length of the arc on the path define by this function for  $1 \leq x \leq 2$ .

EXERCISE 6. Consider the function

$$x = y^3.$$

The path on the graph of this function on  $0 \leq y \leq 2$  is revolved around the  $y$ -axis. Use integration to find the surface area of the resulting figure.