Math 16B
Kouba
Practice Exam 3

1. **PLEASE DO NOT TURN THIS PAGE UNTIL TOLD TO DO SO.**

2. No notes, books, or classmates may be used as resources for this exam. It is a violation of the University honor code to, in any way, assist another person in the completion of this exam. Please keep your own work covered up as much as possible during the exam so that others will not be tempted or distracted. Thank you for your cooperation.

3. Read directions to each problem carefully. Show all work for full credit. In most cases, a correct answer with no supporting work will not receive full credit. The best way to get maximum partial credit is to write neatly and be organized.

4. Make sure that you have seven (7) pages, including the cover page.

5. Include units on answers where units are appropriate.

6. YOU WILL BE GRADED ON PROPER USE OF integral ($\int$), dx, du, and dv notation.

7. You have until 8:50 a.m. to complete the exam.

1.) (6 pts. each) Integrate.

a.) $\displaystyle\int \frac{3 \cos x}{(7 + \sin x)^4} \, dx$

b.) $\displaystyle\int x^2 e^{-x} \, dx$

c.) $\displaystyle\int e^{2x} (5 + e^x)^6 \, dx$

d.) $\displaystyle\int (\cos 2x + \cos^2 2x) \, dx$

2.) Integrate (8 pts. each)

a.) $\int \dfrac{3x+5}{x^2-4} \, dx$

b.) $\int \dfrac{x-4}{x^3+x^2} \, dx$

c.) $\int (\sec 3x - \tan 3x)^2 \, dx$

d.) $\int \cos^3 x \, dx$

3.) (6 pts.) Compute S_6, Simpson's Rule with $n = 6$, to estimate the value of the following definite integral. Write your answer as a decimal to three decimal places.

$$\int_{-2}^{1} \sqrt{3 + 4x^2} \, dx$$

4.) (7 pts.) What should n be in order that the Trapezoidal Rule estimate the exact value of the following definite integral with absolute error at most 0.00003 ?

$$\int_0^2 \ln(1+3x)\, dx$$

RECALL : $|En| \leq \dfrac{(b-a)^3}{12\, n^2} \cdot \max_{a \leq x \leq b} |f''(x)|$

5.) (7 pts. each) Determine the value of each of the following improper integrals.

a.) $\displaystyle\int_0^\infty x^2\, e^{-x^3}\, dx$

b.) $\displaystyle\int_{0}^{3} \frac{x}{9 - x^2}\, dx$

6.) (9 pts.) Use $\displaystyle\int \sqrt{u^2 \pm a^2}\, du = (1/2)\left(u\sqrt{u^2 \pm a^2} \pm a^2 \ln\left| u + \sqrt{u^2 \pm a^2} \right|\right) + C$
to integrate the following.

$\displaystyle\int \sqrt{4x^2 + 16x}\, dx$

EXTRA CREDIT PROBLEM-- The following optional problem is worth 10 extra credit points.

1.) Integrate $\displaystyle\int \frac{1}{x\sqrt{x+1}}\,dx$