Review problems for 135 final exam Spring 2002.

NOTE : The final exam is cumulative and will cover all parts of the course.

This review cover ONLY the sections that weren't coverd in the two midterms.
Other useful references are:
∗ The earlier review sheets.
∗ The exams you had earlier in this course.
∗ Problems from the review sections of the text.

The final exam will be given Thursday, May 9, from 4 to 7 PM.
Location will be announced by your instructor.

Graphing calculators will be used on the Math 135 final exam but computers with QWERTY keyboards are not allowed.

The only cheat sheet you are allowed to use during the exam is the one that will be distributed with the exam. It is also available on the web for you as a study aid.

1. Find the function f given that $f'(x) = e^x - \cos x$ and $f(0) = 2$.

2. Find the equation of the curve that has a slope of $2x - 1$ at any point x and it passes through the point $(1, 3)$.

3. Evaluate the following integrals .

a. $\displaystyle\int \frac{x^2+1}{x^3+3x}dx$

b. $\displaystyle\int e^t(e^t + e^{2t})dt$

c. $\displaystyle\int_1^e \frac{(\ln x)^5}{x}dx$

d. $\displaystyle\int_1^2 \frac{t^2}{5+2t^3}dt$

e. $\displaystyle\int_1^2 (\sqrt[3]{x} + x^2)(2 + \sqrt{x})dx$

f. $\displaystyle\int 5\sin x + \cos(5x)\ dx$

g. $\displaystyle\int_0^{\pi/2} \cos x \sin^8 x dx$

h. $\displaystyle\int_1^2 \frac{5+2t^3}{t^2}dt$

4. Use integration by subtitution, some trigonometric identities and the fact that $-\ln t = \ln 1/t$ to show that $\displaystyle\int \tan x dx = \ln|\sec x| + C$.

5. Let $f(x) = x^2 + 3$ and let R be the region under the graph of $f(x)$ on $[0\,,\,2]$.

a. Sketch the graph of the function f on $[0\,,\,2]$ and indicate the region R.

b. Find an approximation of the area of the region R by a Riemann sum using 4 subintervals and choose the representative points to be the left endpoints.

c. Find an approximation of the area of the region R by a Riemann sum using 4 subintervals and choose the representative points to be the right endpoints.

d. Use definite integration to find the **exact** area of the region R.

e. Let A be the average of the function f on this interval. Find the numerical value of A.

f. Draw the line $y = A$ on your graph and explain what is the connection between the value of A and the value of the area you found in d.

6. The velocity of a car in ft/sec t seconds after starting from rest is given by the function

$$v(t) = 2\sqrt{(t)} \qquad 0 \leq t \leq 30$$

a. Find the car's position at any time t given that the initial position is 0 ft.

b. What is the position of the car at $t = 9$ sec?

c. What is the accelaration of the car at that time?

d. What is its velocity of the car at that time?

7. The marginal profit from the selling of the $x\,th$ item is approximated in dollars by $100 - 0.5\sqrt{x}$. Find the total profit from selling 49 items given that the total profit from selling 9 items is \$895.

8. The nutty professor has just finished integrating some functions when he realized that his dog was messing (and chewing) his notes. All he could find was some pieces of papers with functions (his dog found the $+C$ very tasty, and there were no $+C$ on the notes).
Help the professor to sort out the functions by pairing them to functions and their antiderivatives.

$$(\frac{x}{2} - \frac{1}{4})e^{2x} \qquad \frac{\sin^7 x}{7} \qquad \frac{\ln x}{x^2} \qquad x \cos x$$

$$-\left(\frac{\ln x}{x} + \frac{1}{x}\right) \qquad -x \sin x + \cos x \qquad \sin^6 x \cos x \qquad xe^{2x}$$

9. The number of products assembled by the average worker t hours after starting working at 8 A. M. is given by:

$$f(t) = 10t - \frac{5t^2}{2} \qquad 0 \leq t \leq 4$$

a. Find the total number of units the average worker can be expected to assemble in the 4 hours morning shift.

b. Find the total number of units the average worker can be expected to assemble between 10:00 to 11:00 A.M.

c. Sketch the graph of the function $f(t)$ and shade the region under the graph that represent the number of units the average worker can be expected to assemble between 9:30 and 11:00 A.M.

d. Find at what time the average worker is expected to be the most efficient.