Math 224.02 Name:________________________________
Lab 3 - Sections 8.1-8.3
September 10, 2009

1. Evaluate the integrals, if they exist.

   (a) $\displaystyle\int x \sin 4x \, dx$

   (b) $\displaystyle\int t^3 e^t \, dt$

   (c) $\displaystyle\int_1^4 \sqrt{t} \cdot \ln t \, dt$

   (d) $\displaystyle\int \frac{e^x + 1}{e^x} \, dx$

   (e) $\displaystyle\int \frac{x+1}{x^2+2x} \, dx$

   (f) $\displaystyle\int_1^4 \ln \sqrt{x} \, dx$

   (g) $\displaystyle\int \frac{\ln 3x}{x} \, dx$

   (h) $\displaystyle\int \sin(\ln x) \, dx$

   (i) $\displaystyle\int x^5 e^{x^2} \, dx$

   (j) $\displaystyle\int \frac{e^{\tan x}}{\cos^2 x} \, dx$

   (k) $\displaystyle\int_1^4 e^{\sqrt{x}} \, dx$

   (l) $\displaystyle\int \frac{\sin x \cdot \cos x}{1 - \cos^2 x} \, dx$

2. Find the area under the given curve.

   (a) $y = \sin\left(\dfrac{x}{2}\right), \qquad 0 \le x \le \dfrac{\pi}{3}.$

   (b) $y = x(x^2+1)^4, \qquad 1 \le x \le 2.$

   (c) $y = xe^{-x}, \qquad 0 \le x \le 5.$

3. Prove the reduction formula

$$\int (\ln x)^n \, dx = x(\ln x)^n - n \int (\ln x)^{n-1} \, dx.$$

4. Use integration by parts to show that

$$\int f(x) \, dx = xf(x) - \int xf'(x) \, dx.$$

5. Add/subtract the following fractions:

   (a) $\dfrac{3}{x-2} - \dfrac{2}{x+5}$

   (b) $\dfrac{4}{x-3} + \dfrac{2}{x+1} + \dfrac{3}{(x+1)^2}$

   (c) $\dfrac{2}{x-5} + \dfrac{3x+2}{x^2+1}$

6. Determine values of A and B for which

$$\frac{A}{x-4} + \frac{B}{x+2} = \frac{2x+1}{(x-4)(x+2)}.$$

7. Determine $\displaystyle\int \frac{x}{\sqrt{4-x^2}} \, dx.$