For the upcoming final, you'll need:
1) a blue book;
2) a stapler;
3) remember your TA's name and section time;
4) a picture ID.

The following instruction will be on the real midterm:

Books, notes are NOT allowed except that you may bring a 3" × 5" **card. No calculators are allowed. READ the problems carefully. Put final answers in the boxes on this page. Put high quality work in the blue book for all answers. At the end of exam STAPLE this page to the INSIDE front blue cover of the blue book, so that the front side faces the white writing pages of the blue book; staple only once at the upper left corner (one bonus point for doing this the correct way).**

The following will appear before the instruction on the real midterm:

Print Your Perm Number _____ Name _____

Circle your TA's name and Discussion time:
Ryan Blair R 8am ; 5pm; 6pm; 7pm
Robert Sulway T 8am; 5pm; 6pm; 7pm;

3B Practice Final W 2010
Mar. 2010 Instructor: Prof. Dai

1. Find the derivative of the function $y = \int_{\cos x}^{5x} \cos(u^2)du$.

2. Evaluate the following integrals.

(a)
$$\int e^s \cos(e^s)ds$$
.

(b)
$$\int_0^1 (e - e^x)x\,dx$$
.

(c)
$$\int \frac{\ln^2 x}{x}dx$$
.

(d)
$$\int_0^2 t\sqrt{1+t^2}\,dt$$
.

(e)
$$\int \sin(3x)e^{2x}dx$$
.

(f)
$$\int \sin^2 x \cos^3 x dx$$
.

(g)
$$\int_{-\infty}^{+\infty} \frac{x}{\sqrt[3]{x^2+1}} dx$$
.

(h)
$$\int \frac{x^2}{x^2+5x-6} dx$$
.

(i)
$$\int_1^e (e-x) \ln x dx$$

(j) determine if
$$\int_0^1 \frac{1}{x^2-6x+5} dx$$
is convergent or divergent.

3. A 1000-lb cube of ice must be lifted 50 ft, and it is melting at a rate of 2 lb per minute. Assume that it can be lifted at a rate of one foot every minute. Find the work needed to get the block of ice to the desired height.

4. (a) Find the length of the curve
$$y = \int_1^x \sqrt{\sqrt{t}-1}\, dt \quad 1 \le x \le 16.$$
(b) Find the area of the surface obtained by rotating this curve about y-axis.

5. Determine the volume of the solid obtained by rotating the region bounded by the function $f(x) = e^{x/3}$, the lines $x = 0, x = 1$ and the x-axis around the line $y = 4$.

6. A large tank is designed with ends in the shape of the region between the curves $y = x^2$ and $y = 16$, measured in meters. Find the hydrostatic force on one end of the tank if it is filled with water to a depth of 10 meters. (Water density is $1000kg/m^3$.)