

Math 1B Discussion Section Problems

Rob Bayer

June 24, 2008

You should work on the following problems in groups of 3 or 4. Try to get through as many as you can, but you aren't expected to finish everything. Instead, you should make sure everyone in your group knows **how** to solve all the problems, and not just the answers.

More Integration By Parts

1. What's wrong with the following "proof" that $0=1$?

$$\ln x = \int \frac{1}{x} \underset{u=\frac{1}{x}, dv=dx}{=} \frac{1}{x} x - \int -\frac{1}{x^2} x = 1 + \int \frac{1}{x} = 1 + \ln x$$

2. Find $\int e^{ax} \sin x dx$, where a is any real number.
3. As we said in class yesterday, when doing integration by parts you don't need to worry about the $+C$ when finding v from dv . Try to convince yourself that this is true by computing $\int xe^x dx$ and taking $v = e^x + C$.

Trig Integrals I

1. (the basics) Find each of the following:

(a) $\int \sin^3 x \cos^4 x dx$

(b) $\int_{-\pi/4}^{\pi/4} \tan^5(x) \sec^3(x) dx$

(c) $\int \frac{1 - \tan^2(x)}{\sec^2(x)} dx$

2. (a little harder) Let $n = 2k + 1$ be an odd integer. Find $\int_0^{\pi/2} \cos^n x dx$

Trig Integrals II

1. (basics) Determine each of the following:

(a) $\int \sin(4x) \sin(3x) dx$

- (b) The average value of $\sin^2 x$ between 0 and 2π . Now sketch a graph of $\sin^2 x$. Does your answer seem reasonable?

(c) $\int \cos(4x) \sin^2(3x) dx$ (Hint: this can be re-written as $\cos 4x (\sin 3x \sin 3x)$)

2. (a little harder)

(a) Find $\int \frac{\cos x - 1}{\cos x + 1}$

- (b) Now let $n = 2k$ be an even integer. Find $\int_0^{\pi/2} \cos^n x dx$