

Math 129-8H Written Homework #2

Due September 10, in class.

1. Compute the following integrals:

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

(b) $\int_0^\pi e^x \sin e^x dx$

2. Compute the following integrals:

(a) $\int x^2 \cos 3x dx$

(b) $\int_1^e x^2 \ln(3x) dx$

3. Some functions are defined as integrals. Consider the functions F_k defined by

$$F_k(x) = \int_0^x \sqrt{1 - k^2 \sin^2 t} dt.$$

These functions are called elliptic functions of the second kind and can be thought of as just some other set of functions like e^x , $\sin x$, etc. In fact, you can find tables of values for these functions in standard mathematical reference books. Notice that $F_k(0) = 0$. Find the following integrals in terms of the functions F_k by using integration by parts or substitution. Answers should be a number like $3e^2 + F_1(2) - \frac{1}{2}F_1(\pi)$ or something like that.

(a) $\int_0^1 \sqrt{1 - \sin^2 t} dt$

(b) $\int_0^1 t \sqrt{1 - \sin^2(t^2)} dt$

(c) $\int_0^1 \frac{t \sin t \cos t}{\sqrt{1 - \sin^2 t}} dt$ (Hint: consider the derivative of $\sqrt{1 - \sin^2 t}$ and then do integration by parts).