

PHY101 HW #8
Due Friday 3/1/2013

Reading

Read Chapter 7 of Boas.

Problems

Despite what it says in the text, do not use tables of transforms for any of these problems. However, you may use the fact that $\int \exp(-x^2) = \sqrt{\pi}$ for problem 21 from section 12. All other integrals can be done using elementary methods or by contour integration.

From Boas Chapter 7:

Section 5 page 355, problem 7.

Section 7 page 360, problems 7, 12. (Note: The instructions about problems 5.1-5.9 refer to problems 1-9 from section 5 of the current chapter (7).)

Section 8 page 363, problems 7, 13. (Note: The instructions about problems 5.1-5.9 refer to problems 1-9 from section 5 of the current chapter (7).)

Section 9 page 370, problems 1, 23. [Problem 23 says that you need a Fourier sine series, but you may need cosines as well or instead.]

Section 12, page 384: problem 3, 8, 21. For these problems evaluate both the Fourier transform (to find $g(\alpha)$) and the inverse Fourier transform to verify that $f(x) = \int_{-\infty}^{\infty} g(\alpha)e^{i\alpha x}$. The inverse transform is straightforward for problem 21, and for problems 3 and 8 it can be evaluated by contour integration – though it is somewhat subtle. While $g(k)$ is non-singular on the real axis, the inverse Fourier transform is most easily evaluated by i) first moving the contour somewhat off of the real axis and ii) then writing the integral as a sum of several separate integrals, each of which *do* have poles on the real axis. iii) Each of these separate integrals can then be converted into a closed contour integral by adding an appropriate arc at infinity. Be careful, however! Some terms may require an arc at infinity in the upper half-plane, while some require an arc in the lower half-plane. Also, which half-plane is required may depend on the value of x .

Section 13, page 387: problem 4.