

PHYS 2380 - Assignment 4 - Integral table

Useful integrals for Assignment 4

March 23, 2017

The following integrals will simplify some problems in Assignment 4. Rather than look them up in a table or calculate them numerically, it may be easier to gather them together. We have used some of them in class already.

$$\int_{-\infty}^{\infty} e^{-u^2} du = \sqrt{\pi} \quad (1)$$

$$\int_{-\infty}^{\infty} u^2 e^{-u^2} du = \frac{\sqrt{\pi}}{2} \quad (2)$$

$$\int_{-\infty}^{\infty} u^4 e^{-u^2} du = \frac{3\sqrt{\pi}}{4} \quad (3)$$

In addition to these integrals, you may also need to evaluate integral 2 (above) over a particular limit. This integral can be simplified somewhat using integration by parts, but it is by no means a clean solution. When (if) you find the need to evaluate the integral with limits that are not over all space, just check for the appropriate lower limit x on the table below. The corresponding value of the integral $F(x)$ is given.

Let us define

$$F(x) = \int_x^{\infty} u^2 e^{-u^2} du. \quad (4)$$

x	$F(x)$
$\frac{\sqrt{\pi}}{3}$	0.3871
$\frac{\sqrt{\pi}}{2}$	0.2951
1	0.2536
$\sqrt{2}$	0.1159
$\sqrt{3}$	0.0495
$\sqrt{\pi}$	0.0437
2	0.0204
$\sqrt{6}$	0.0033
$\sqrt{7}$	0.0013
$\sqrt{8}$	5.025×10^{-4}
3	1.949×10^{-4}
4	2.319×10^{-7}