

Theoretical Physics
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Chapter B Homework. What is e? Euler's Formula, Integral Tricks

HW-B1. An Integral Family with Exponential Decay. Use the standard method to evaluate the integral

$$\int_0^{\infty} e^{-x} dx .$$

Then use one of our tricks to give the general result in terms of n for

$$\int_0^{\infty} x^n e^{-x} dx ,$$

where $n = 0, 1, 2, \dots$

HW-B2. Some Integrals with Gaussians. Use a standard method to evaluate the integral

$$\int_0^{\infty} x e^{-x^2} dx .$$

Then use one of our tricks to give the general result in terms of n for

$$\int_0^{\infty} x^{2n-1} e^{-x^2} dx ,$$

where $n = 1, 2, 3, \dots$

HW-B3. Integral with Quadratic and Linear Exponent. Use one of our tricks to evaluate the following integral where $a > 0$.

$$\int_{-\infty}^{\infty} x e^{-ax^2+bx} dx .$$