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 an integral similar to

$$\int_0^\infty e^{-x}\,dx$$ that you will need for the next part.

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

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

where n = 0, 1, 2, ... What should you do if you do not see a parameter that you can use for differentiation?

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

$$\int_0^\infty x e^{-x^2}\,dx$$ that you will need for the next part.

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

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

where n = 1, 2, 3, ... What should you do if you do not see a parameter that you can use for differentiation?

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

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