Some mathematical formulas *

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Definite integrals:

$$\int_0^{\pi/2} \sin^\mu x \cos^\nu x \, \mathrm{d}x = \frac{\Gamma\left(\frac{\mu+1}{2}\right)\Gamma\left(\frac{\nu+1}{2}\right)}{2\Gamma\left(\frac{\mu+\nu}{2}+1\right)}, \quad \int_0^1 t^{p-1}(1-t)^{q-1}\,\mathrm{d}t = \frac{\Gamma(p)\Gamma(q)}{\Gamma(p+q)},$$
$$\int_{-\infty}^{\infty} \mathrm{e}^{-ax^2+bx}\,\mathrm{d}x = \sqrt{\frac{\pi}{a}}\mathrm{e}^{\frac{b^2}{4a}},$$
$$\int_0^{\infty} x^{\mu-1}\mathrm{e}^{-ax}\,\mathrm{d}x = \frac{\Gamma(\mu)}{a^\mu}, \quad \int_0^{\infty} x^{\mu-1}\mathrm{e}^{-ax^2}\,\mathrm{d}x = \frac{\Gamma(\mu/2)}{2a^{\mu/2}}.$$

Special functions:

$$\Gamma(z+1) = z\Gamma(z), \quad \Gamma(n) = (n-1)!, \quad \Gamma(1/2) = \sqrt{\pi}.$$
$$H_{n+1} = 2\xi H_n - 2nH_{n-1}.$$
$$\rho^2 Z'' + \rho Z' + (\lambda^2\rho^2 - \nu^2)Z = 0 \implies Z = c_1 J_\nu(\lambda\rho) + c_2 N_\nu(\lambda\rho).$$

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