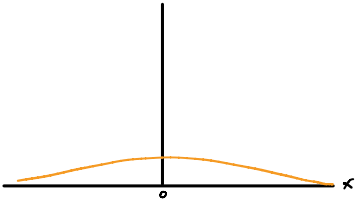
1) **[Marc]**

What is the heat kernel for the equation $u_t = u_{xx}$ on the whole x- axis?

The heat kernel for $u_t - u_{xx} = 0$ is

$$\Gamma_1(x,t) = \frac{1}{\sqrt{4\pi t}} \exp\left(|x|^2/4t\right)$$



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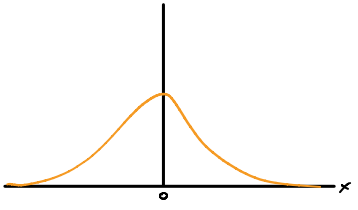

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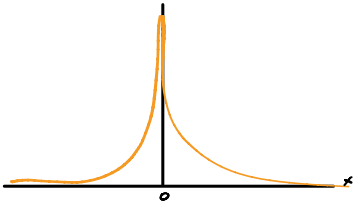

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To use it to solve the heat equation with initial data $u(x,0) = g(x)$ (over like $\mathbb{R}$), we convolute the heat kernel with $g(x)$ and obtain our solution:

Dirichlet conditions

$$u(x,t) = \int_{\mathbb{R}} \Gamma(x-\xi, t)\, g(\xi)\, d\xi$$