

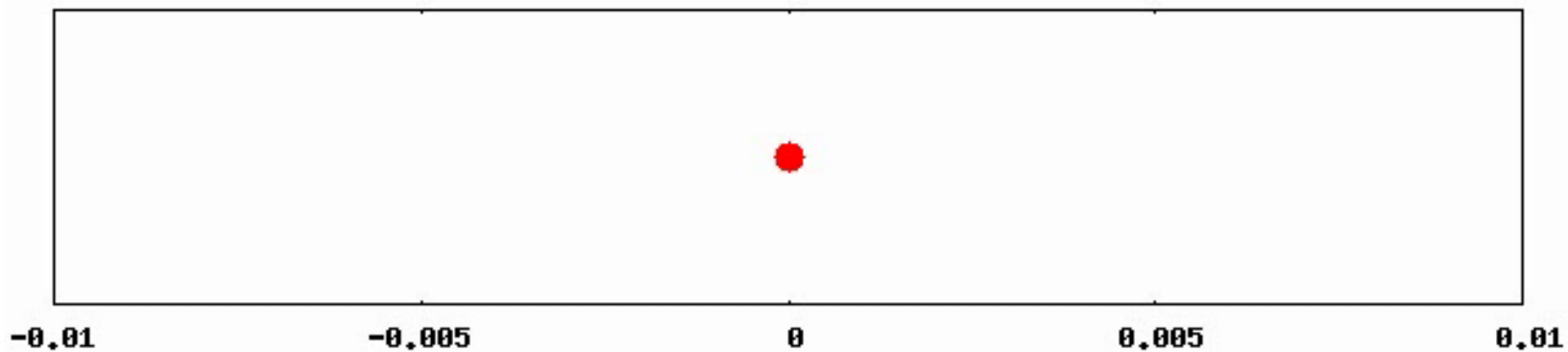
Langevin方程式

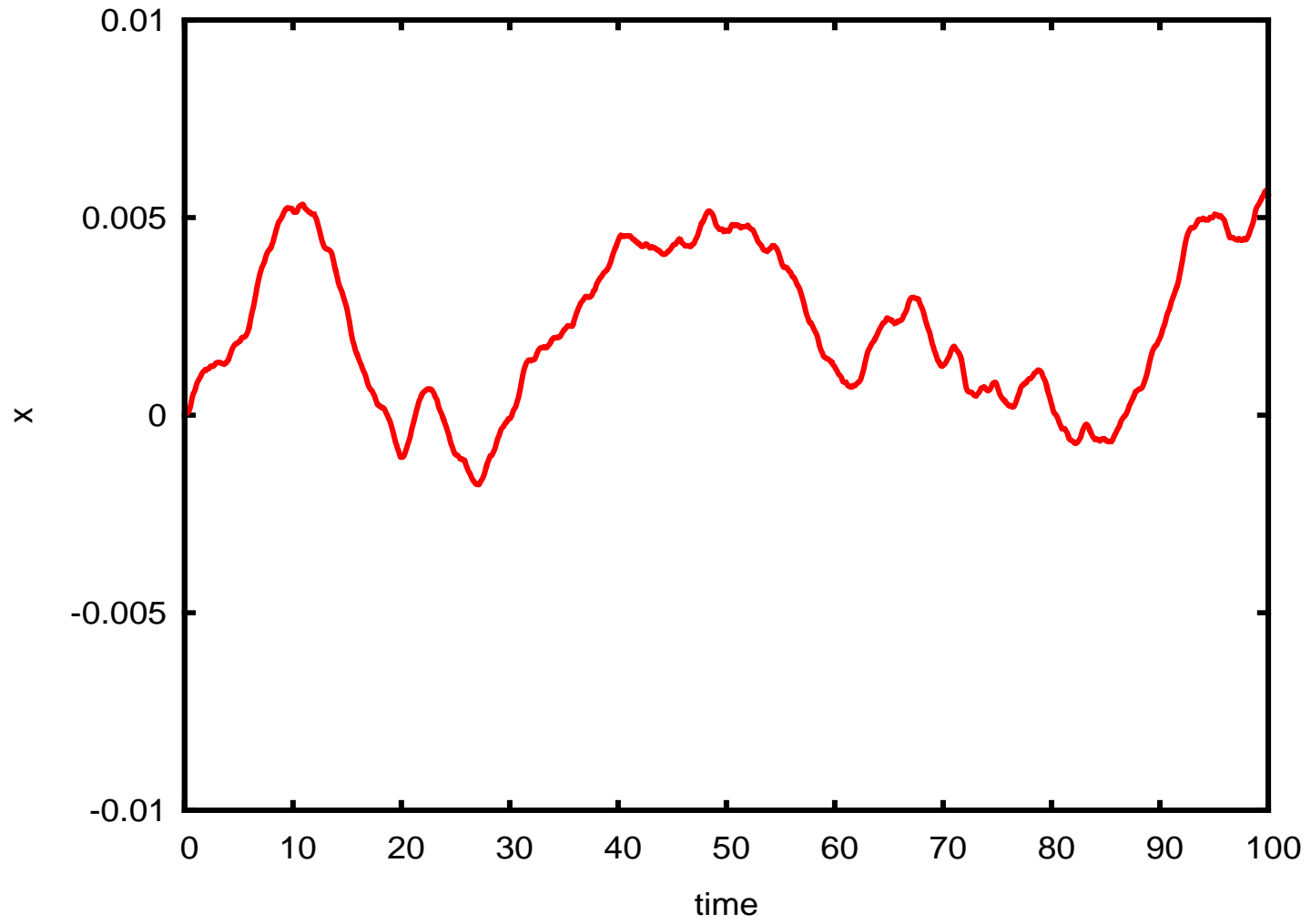
$$m \frac{d^2 \mathbf{r}}{dt^2} = -k \frac{d\mathbf{r}}{dt} + \xi(t)$$

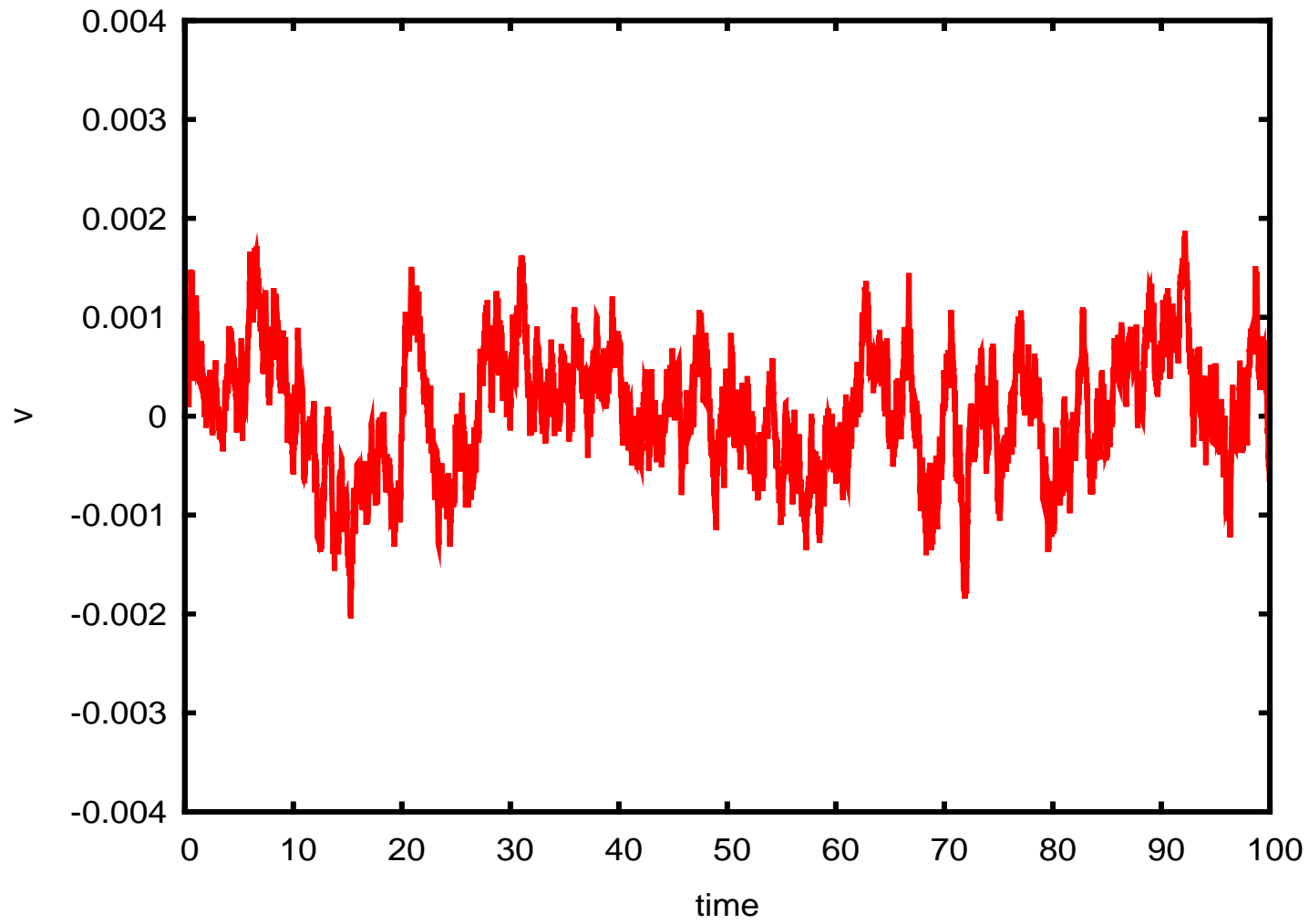
$$\langle \xi(t) \rangle = 0$$

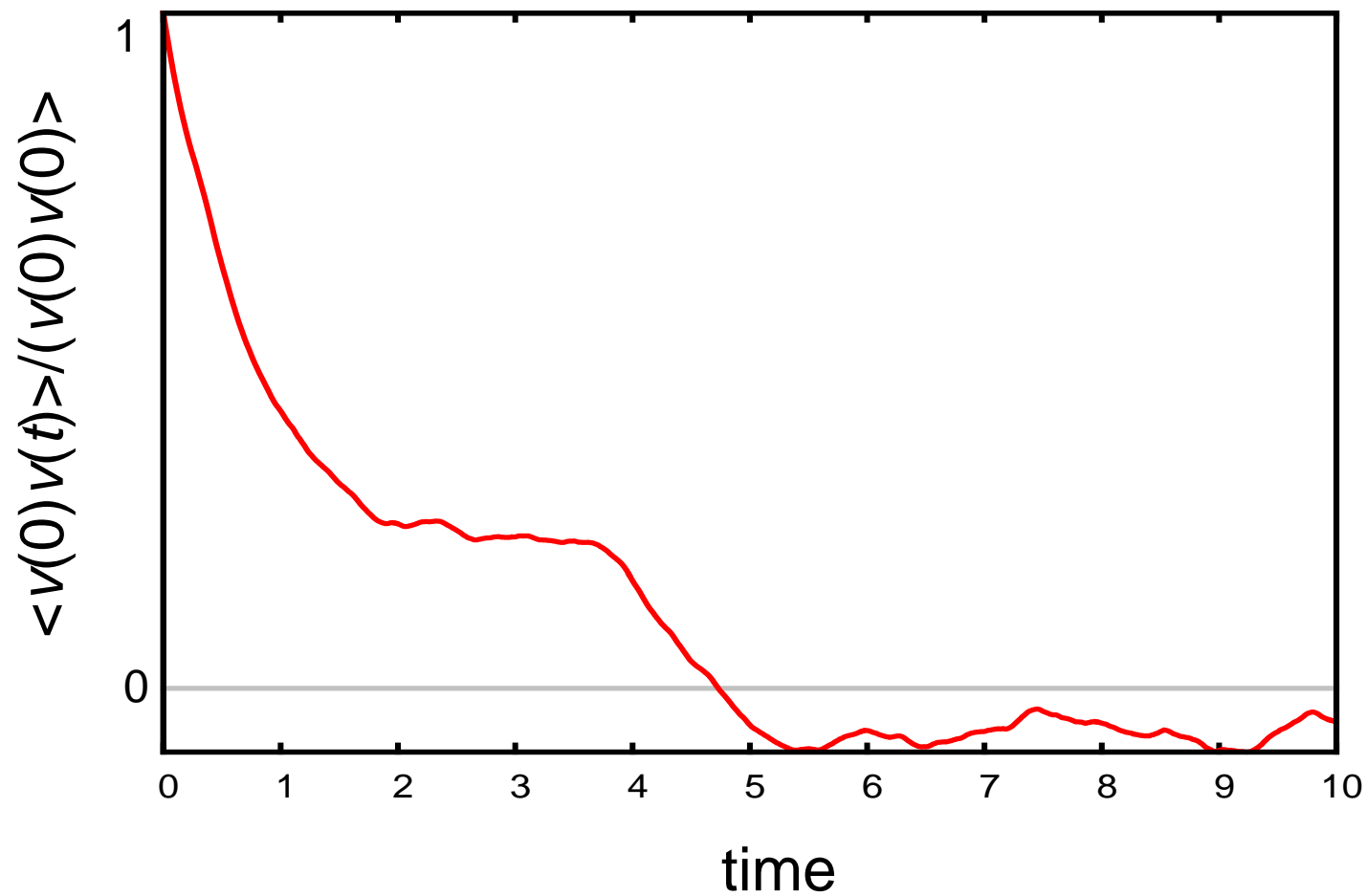
$$\langle \xi(t) \cdot \xi(s) \rangle = M \delta(t - s)$$

1次元系でのLangevin方程式による挙動

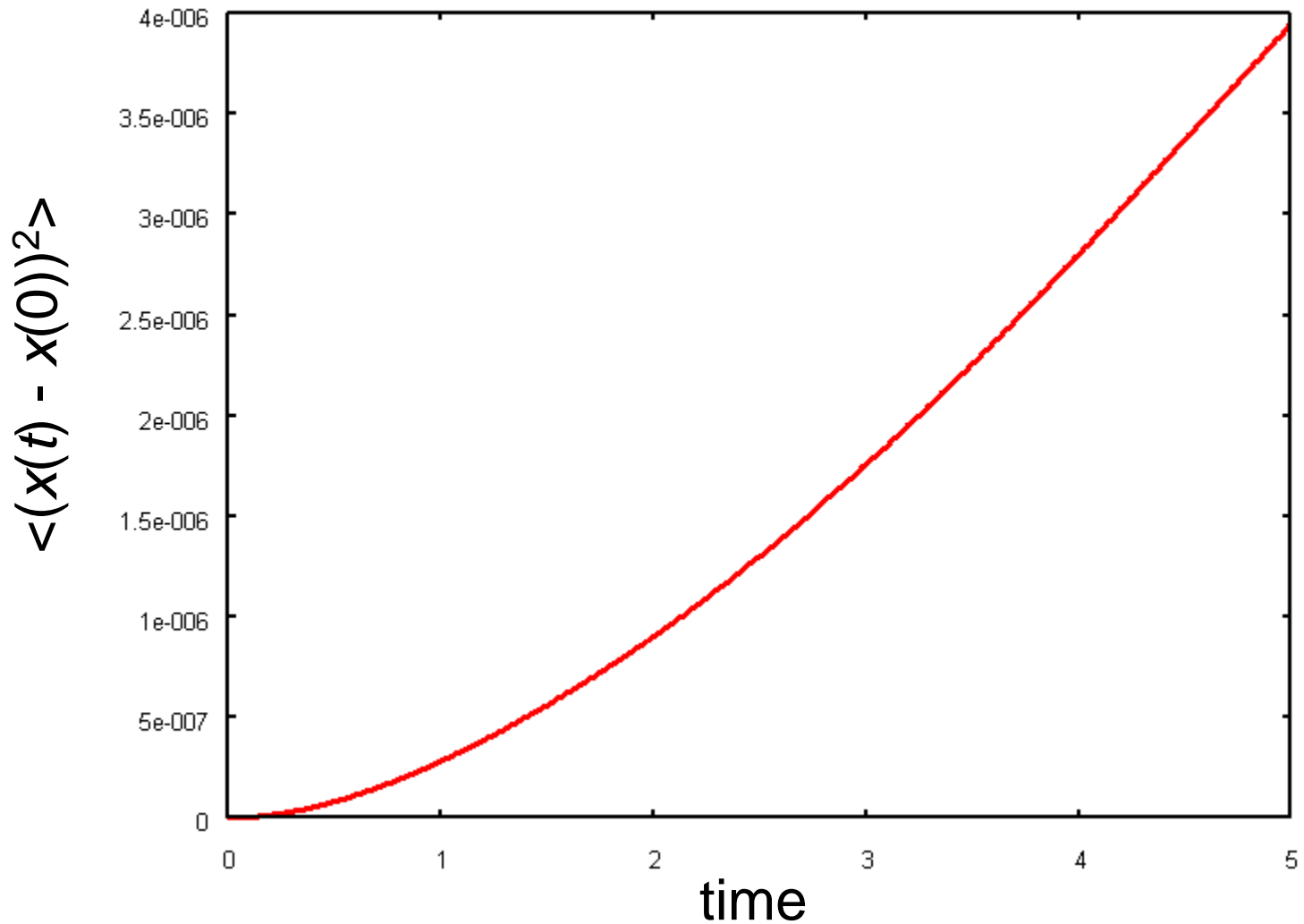






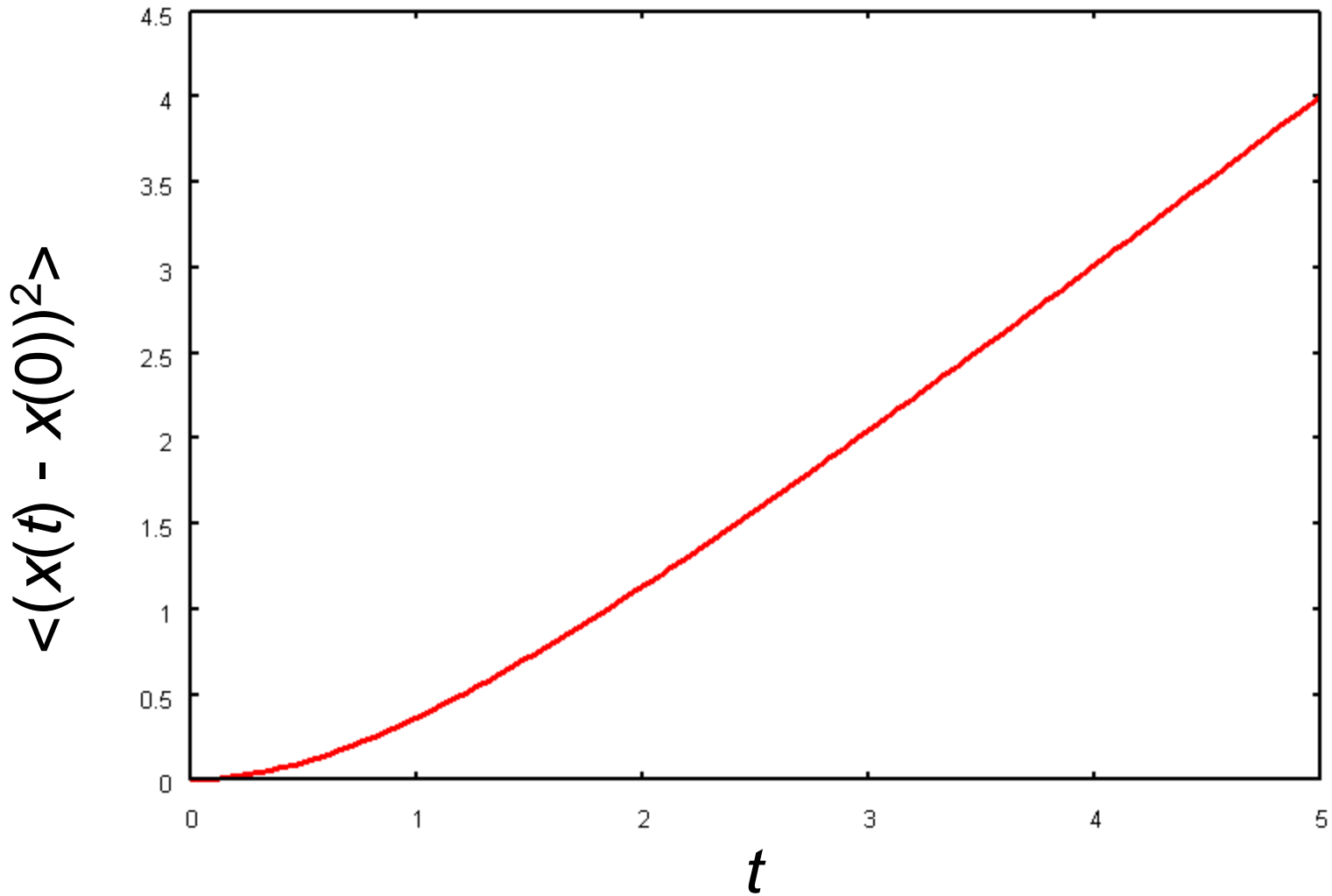


$$\langle v(0)v(t) \rangle / \langle v(0)v(0) \rangle \propto \exp(-t/\tau)$$



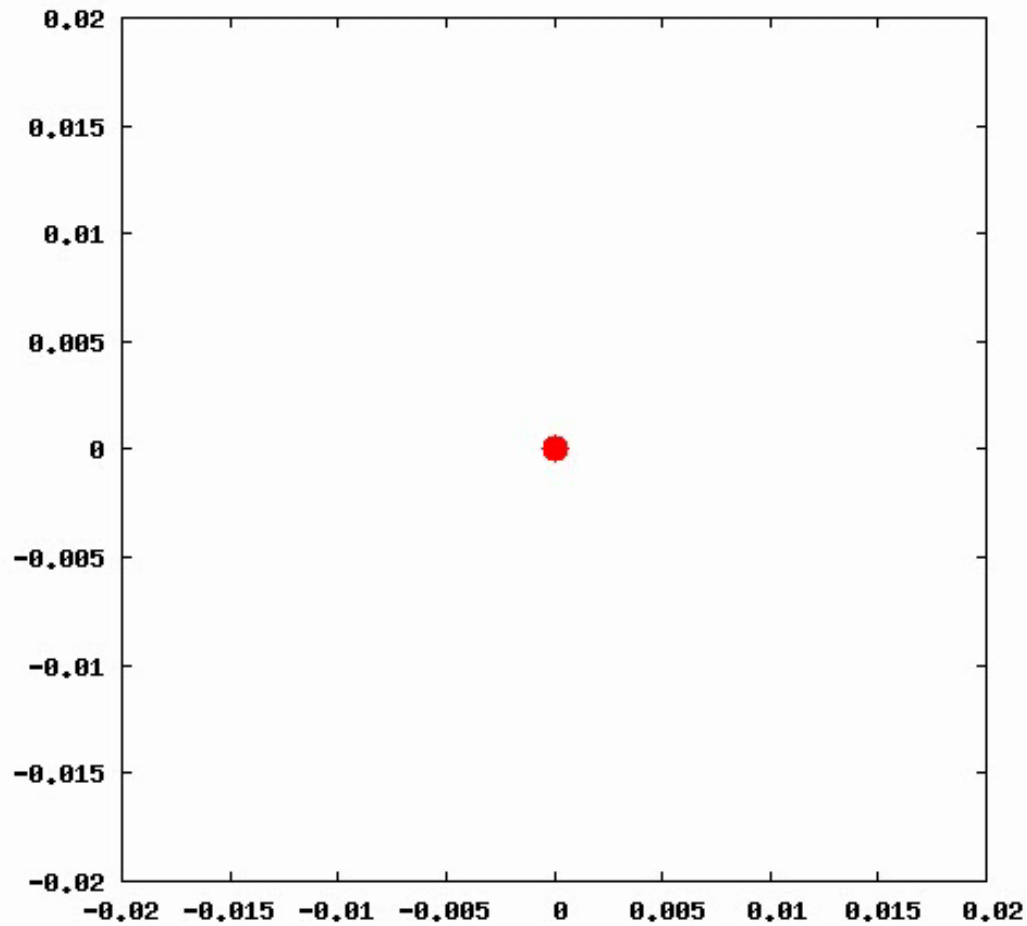
$$\langle (x(t) - x(0))^2 \rangle \propto t \quad \text{when } t \rightarrow \infty$$

$$\langle (x(t) - x(0))^2 \rangle = (2Mt/\gamma) [t - (m/\gamma) \exp(-\gamma t/m)]$$



$$\langle (x(t) - x(0))^2 \rangle = (2Mt/\gamma) [t - (m/\gamma) \exp(-\gamma t/m)]$$

2次元での数値計算



軌跡を残すと

