$$g(\theta^* \mid \theta^{(t-1)}) = h(\underbrace{\theta^* - \theta^{(t-1)}})$$

$$g(\theta_b \mid \theta_a) = \frac{1}{\sqrt{2\pi\sigma^2}} \exp\left[-\frac{(\theta_b - \theta_a)^2}{2\sigma^2}\right], \quad h(x) = \frac{1}{\sqrt{2\pi\sigma^2}}\exp\left(-\frac{x^2}{2\sigma^2}\right)$$

if θ is univariate $\quad \theta_b \mid \theta_a \sim N(\theta_a, \sigma^2)$

$$g(\theta_b \mid \theta_a) = g(\theta_a \mid \theta_b) \Rightarrow \theta_a \mid \theta_b \sim N(\theta_b, \sigma^2)$$

In MH algorithm, if $g(\theta_b \mid \theta_a) = g(\theta_a \mid \theta_b)$ symmetry

for any θ_a, θ_b,

$$r = \frac{f(\theta^*)\, \cancel{g(\theta^{(t-1)} \mid \theta^*)}}{f(\theta^{(t-1)})\, \cancel{g(\theta^* \mid \theta^{(t-1)})}} = \frac{f(\theta^*)}{f(\theta^{(t-1)})}$$

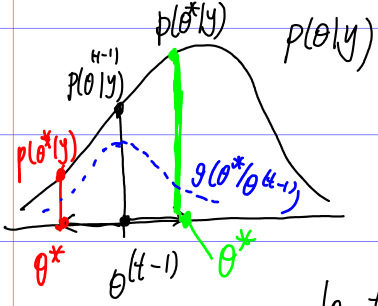
$p(\theta \mid y) \propto f(\theta)$

$$= \frac{p(\theta^* \mid y)}{p(\theta^{(t-1)} \mid y)}$$

$$p(\theta \mid y) = \frac{f(\theta)}{C}$$

MH algorithm: If $r > 1$, always accept θ^*, set $\theta^{(t)} = \theta^*$

If $r < 1$, accept θ^* with prob r.



$\theta^{(1)}, \theta^{(2)}, \theta^{(3)}, \ldots$

In this posterior Markov chain sample, the relative frequencies of θ's should roughly match with the "height" of their posterior density values.