- Prior for Θ: $f(\theta)$

- Posterior Θ:

$$f(\theta | X_1 = x_1, \dots, X_n = x_n) \propto f(x_1, \dots, x_n | \Theta = \theta) f(\theta)$$

$$= \left(\prod_i f(x_i | \Theta = \theta)\right) f(\theta)$$

$$f(\theta | \vec{X} = \vec{x}) = c\, f(\vec{x} | \Theta = \theta) f(\theta)$$

$$1 = \int_{-\infty}^{\infty} f(\theta | \vec{X} = \vec{x}) = c \int_{-\infty}^{\infty} f(\vec{x} | \Theta = \theta) f(\theta)\, d\theta$$

$$\Rightarrow c = \frac{1}{\int_{-\infty}^{\infty} f(\vec{x} | \Theta = \theta) f(\theta)\, d\theta}$$

If Θ is k-dimensional, need to compute k-dimensional integral..

Expensive!

Approximate Bayes

- Given prior $f(\theta)$
- sample $\Theta_1, \Theta_2, \dots, \Theta_k$ from prior
- for each $i = 1, 2, \dots, k$
  - sample data $X_1^{(k)}, \dots, X_n^{(k)} \sim f(\vec{x} \mid \Theta = \theta_i)$
  - decide if $\vec{X}^{(k)}$ represents your data $\vec{X}$
    - if yes, save p
    - if no, discard p
- look at distribution of saved p.