Ex 3.6

$y \sim \mathcal{N}(x\beta, \sigma^2 I)$

$\beta \sim \mathcal{N}(0, \tau I)$

$P(\beta|y) \propto P(y|\beta) P(\beta)$

$$P(y|\beta) = \frac{1}{\sqrt{2\pi\sigma^2}} \exp\left\{ -\frac{1}{2\sigma^2} (y-x\beta)^T (y-x\beta) \right\}$$

$$P(\beta) = \frac{1}{\sqrt{2\pi\tau}} \exp\left\{ -\frac{1}{2\tau} \beta^T \beta \right\}$$

$$P(\beta|y) = c_1 \exp\left\{ -\frac{1}{2\sigma^2} (y-x\beta)^T (y-x\beta) - \frac{1}{2\tau} \beta^T \beta \right\} c_2$$

$$\propto e^{-\frac{1}{2\sigma^2}} \left\{ \exp\left((y-x\beta)^T (y-x\beta) - \frac{\sigma^2}{\tau} \beta^T \beta \right) \right\}$$