Gamma prior

$$p(\gamma) = \Gamma(\gamma|a,b) \propto \gamma^{a-1} e^{-b\gamma}$$

$$p(\gamma|x) \propto p(x|\gamma)p(\gamma)$$

$$p(\gamma|x) \propto \left(\gamma^{\frac{1}{2}} e^{-\gamma \frac{(x-\mu)^2}{2}}\right) \cdot \left(\gamma^{a-1} e^{-b\gamma}\right)$$

$$p(\gamma|x) \propto \gamma^{\frac{1}{2}+a-1} e^{-\gamma(b+\frac{(x-\mu)^2}{2})}$$

$$p(\gamma|x) = \Gamma(a+\tfrac{1}{2}, b+\frac{(x-\mu)^2}{2})$$