Hw2 part 1, Jordyn milyndo, 1000538673

$$\exp\left\{-\frac{1}{2}\left[\left(\sum_{i=1}^{n}\phi(x_i-\theta)^2\right)+\tau(\theta-\theta_0)^2\right]\right\}$$

$$=\exp\left\{-\frac{1}{2}\left[\sum_{i=1}^{n}\phi(x_i^2-2x_i\theta+\theta^2)+\tau(\theta^2-2\theta\theta_0+\theta_0^2)\right]\right\}$$

$$=\exp\left\{-\frac{1}{2}\left[\phi\sum_{i=1}^{n}x_i^2-2\phi\theta\sum_{i=1}^{n}x_i+n\phi\theta^2+\tau\theta^2-2\theta\theta_0\tau+\tau\theta_0^2\right]\right\}$$

* b/c of porportionality, we can remove terms that do not include θ to exp

$$\propto\exp\left\{-\frac{1}{2}\left[\theta^2(\tau+n\phi)-2\phi\theta\sum_{i=1}^{n}x_i-2\theta\theta_0\tau\right]\right\}$$

$$=\exp\left\{-\frac{1}{2}(\tau+n\phi)\left[\theta^2-\frac{2\theta}{\tau+n\phi}(\theta_0\tau+\phi\sum_{i=1}^{n}x_i)\right]\right\}$$

* b/c of proportionality, we can add terms to exp that do not include θ

$$\propto\exp\left\{-\frac{1}{2}(\tau+n\phi)\left[\theta^2-\frac{2\theta}{\tau+n\phi}(\theta_0\tau+\phi\sum_{i=1}^{n}x_i)+\left(\frac{\theta_0\tau+\phi\sum_{i=1}^{n}x_i}{\tau+n\phi}\right)^2\right]\right\}$$

* complet the squre

$$=\exp\left\{-\frac{1}{2}(\tau+n\phi)\left[\theta-\frac{\theta_0\tau+\phi\sum_{i=1}^{n}x_i}{\tau+n\phi}\right]^2\right\}$$

□