...-001 Mid-Term Assignment on Page 20.

Let $\pi(\theta) = \frac{1}{c}\exp(-\frac{1}{2}(\theta+\cos\theta)^2)$ where $c = \int e^{-\frac{1}{2}(\theta+\cos\theta)^2} d\theta$.

$\log(\pi(\theta)) = \log(\frac{1}{c}) + \log(\exp(-\frac{1}{2}(\theta+\cos\theta)^2)) = -\log c - \frac{1}{2}(\theta+\cos\theta)^2$, $m=0$.

$\left(\because \frac{f(Y)}{Mg(Y)} \le 1\right)$ for all y

$[\log(\pi(\theta))]' = -(\theta+\cos\theta)\cdot(1+(-\sin\theta)) = -(\theta+\cos\theta)(1-\sin\theta)$

$[\log(\pi(\theta))]'' = -\left[(1-\sin\theta)^2 + (\theta+\cos\theta)(-\cos\theta)\right] = -(1-\sin\theta)^2 + \cos\theta(\theta+\cos\theta)$

$[\log(\pi(0))]'' = -1+1 = 0$.

Since we have that $[\log(\pi(\theta))]''\big|_{\theta=0} = 0$, we choose another θ by setting that $[\log(\pi(\theta))]' = 0$

$\Leftrightarrow -(\theta+\cos\theta)(1-\sin\theta) = 0 \Leftrightarrow \theta_1 = \frac{\pi}{2}$, $\theta_2 \approx -0.739$, since when $\theta_1 = \frac{\pi}{2}$ $[\log(\pi(\theta))]''\big|_{\theta=\frac{\pi}{2}} = 0$, we choose.

$\theta = \theta_2 \approx -0.739$. $\therefore [\log(\pi(\theta))]''\big|_{\theta=-0.739} = \underbrace{-(1-\sin(-0.739))^2}_{=-(1+\sin(0.739))^2} \approx -2.8$

$\therefore \pi(\theta) \propto \exp(-1.4(\theta+0.739)^2)$

$$\frac{\int_{-\infty}^{x} f(Y)dy}{\int_{-\infty}^{+\infty} f(Y)dy}$$

$\triangleq$ density.