①

a) $\int_{\Theta}^{\infty} |\theta - \delta(x)| \pi(\theta|x)\, d\theta$

$$= \int_{-\infty}^{\delta(x)} (\delta(x) - \theta)\pi(\theta|x) + \int_{\delta(x)}^{\infty} (\theta - \delta(x))\pi(\theta|x)$$

$$= 2\int_{-\infty}^{\delta(x)} \pi(\theta|x)\, d\theta = \int_{-\infty}^{\infty} \pi(\theta|x)\, d\theta = 1$$

$$\int_{-\infty}^{\delta(x)} \pi(\theta|x)\, d\theta = 1/2$$

$$2\int_{-\infty}^{\delta(x)} \pi(\theta|x)\, d\theta - 1 = 0$$

$$\cancel{2\pi(\delta(x)|\theta)}$$

$$\boxed{2\pi(\delta|x) = 0}$$

5b

$$\int_{m}^{\infty} pdf(x) \, dx = \int_{-\infty}^{m} pdf(x) \, dx$$

$$pdf(x) = \frac{1}{\sqrt{2\pi\sigma^2}} e^{-\frac{(x-\mu)^2}{2\sigma^2}}$$

$$p(y|x) = .3 N(y: 1, 1) + .7 N(y; -1, 1)$$

$$\to = .3\left(\frac{1}{2\pi(1)^2} e^{-\frac{(x-1)^2}{2}}\right.$$

$$+ .7\left(\frac{1}{2\pi} e^{-\frac{(x+1)^3}{2}}\right)$$

$$\int_{-\infty}^{m} .3\left(\frac{1}{2\pi} \exp\left(\frac{-(x-1)}{2}\right)^3\right) dx$$

$$+ \int_{-\infty}^{m} .7\left(\frac{1}{2\pi} \exp\left(\frac{-(x+1)}{2}\right)^2\right) dx$$

c) $$\int_{-\infty}^{\infty} .3\left(\frac{1}{2\pi}\exp\left(-\frac{(x-1)^2}{2}\right)\right)dx$$

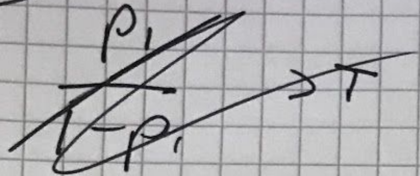
$$+\int_{-\infty}^{\infty} .7\left(\frac{1}{2\pi}\exp\left(-\frac{(x+1)^2}{2}\right)\right)dx$$

d) They are different because

the mode will stretch over

a longer range

(2)



$LFN \; P(y=1|x) = L(\hat{y}=0|x)$

$LFP \; P(y=0|x) = L(\hat{y}=1|x)$

$LFN = c\,LFP$

$c\,LFP \cdot P(y=1|x) = L(\hat{y}=0|x) = c\,LFP \cdot (1-P(y=0|x)$

$= c\,LFP - c\,LFP\,P(y=0|x)$

$\hat{y}=1$ iff $L(\hat{y}=0|x) > L(\hat{y}=1|x)$

$c\,LFP - c\,LFP\,P(y=0|x) > LFP\,P(y=0|x)$

$c - c\,P(y=0|x) > P(y=0|x)$

$c < (c+1)\,P(y=0|x)$

$\frac{c}{c+1} < P(y=0|x)$ $\rightsquigarrow$ $P(y=0|x) < T$

$T = \frac{c}{c+1}$

Problem 3,4,5, and 6 are displayed in the matlab files. To run the files, you need the Matlab 'Statistics and Machine Learning Toolbox'. To see the answers to each file, simply run them through the editor to get the results.