3.)

$$p_K(x) = \frac{\pi_K \cdot \left(\frac{1}{\sqrt{2\pi}\sigma_K}\right) \exp\left(\frac{-1}{2\sigma_K^2}(x-\mu_K)^2\right)}{\sum_{l=1}^{K} \pi_l \left(\frac{1}{\sqrt{2\pi}\sigma_l}\right) \exp\left(-\frac{1}{2\sigma_l^2}(x-\mu_l)^2\right)} = \eta$$

$$\log(p_K(x)) = \ln(\pi_K) - \left(\tfrac{1}{2}\right)\ln(2\pi\sigma_K) - \left(\frac{1}{2\sigma_K^2}\right)(x-\mu_K)^2 - \ln(\eta)$$

$$(\underline{x^2} - 2x\mu_K + \mu_K^2)$$

Since this is a quadratic function of x, here the Bayes classifier is not linear.

✓

4.) (a) Fraction $= \int_0^1 \frac{(1.1x - 0.9x)}{1} dx = \int_0^1 (0.2)x\,dx = 0.2 \left|\frac{x^2}{2}\right|_0^1$

$= 0.2\left(\tfrac{1}{2}\right) = 10\%$

↳ multiplicative intepretation

(b)

(a2) Additive Intepretation: Same.

$p=1 \Rightarrow l = 0.1$

$p=2 \Rightarrow .1 = s^2 \Rightarrow s = \sqrt{.1} = .32$

$p=100 \Rightarrow .1 = s^{100} \Rightarrow s = \sqrt[100]{.1}$

$= (.1)^{1/100}$

(b) $1\% = (.10) \times (.10)$

(c) $(.10)^{100}$ = very small.

(d) Clearly the more dimensions you use, you decrease exponentially the available training points to make your prediction ⇒ drawback of KNN when p is large.

(e)