CH04 Q02

$$p_k(x) = \frac{\pi_k \frac{1}{\sqrt{2\pi}\sigma} \exp\left(-\frac{1}{2\sigma^2}(x-\mu_k)^2\right)}{\sum_{l=1}^{K} \pi_l \frac{1}{\sqrt{2\pi}\sigma} \exp\left(-\frac{1}{2\sigma^2}(x-\mu_l)^2\right)}$$

$$\ln p_k(x) = \ln\left(\pi_k \frac{1}{\sqrt{2\pi}\sigma} \exp\left(-\frac{1}{2\sigma^2}(x-\mu_k)^2\right)\right) - \underbrace{\ln\left(\sum_{l=1}^{K} \pi_l \frac{1}{\sqrt{2\pi}\sigma} \exp\left(-\frac{1}{2\sigma^2}(x-\mu_l)^2\right)\right)}_{= L}$$

$$= \ln(\pi_k) + \ln\left(\frac{1}{\sqrt{2\pi}\sigma}\right) - \frac{1}{2\sigma^2}(x-\mu_k)^2 + L_1$$

$$= \ln(\pi_k) - \frac{(x^2 - 2x\mu_k + \mu_k)^2}{2\sigma^2} + L_2$$

$$= \underbrace{\ln(\pi_k) - \frac{\mu_k^2}{2\sigma^2} + \frac{x\mu_k}{\sigma^2}}_{= \delta_k(x) \ (4.18)} + L_3$$

CH04 Q06

X_1 = hour studied , X_2 = undergrad GPA , Y = receive an A

$$\ln\left(\frac{p(X)}{1-p(X)}\right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2$$

$$= -6 + 0.05 X_1 + X_2$$

(a) $X_1 = 40$, $X_2 = 3.5$

$$\frac{p(X)}{1-p(X)} = e^{-6+0.05\times 40+3.5}$$

$$\doteq 0.6065$$

$$p(X) = (1-p(X))\, 0.6065$$

$$1.6065\, p(x) = 0.6065$$

$$p(X) \doteq 0.3775$$

$\therefore$ the prob. that this student get A is 0.3775

(b) $p = 0.5$

$$\frac{0.5}{1-0.5} = e^{-6+0.05x_1+3.5}$$

$$\Rightarrow -6 + 0.05x_1 + 3.5 = 0$$

$x_1 = 50$ hours #