Problem 1

$\mu \sim N(\mu_0, \sigma_0^2)$

$P(\mu) = \frac{1}{\sqrt{2\pi\sigma_0}} \cdot e^{-\frac{(\mu-\mu_0)^2}{2\sigma_0^2}}$, $\ln P(\mu) = -\ln\sqrt{2\pi\sigma_0} - \frac{(\mu-\mu_0)^2}{2\sigma_0^2}$

$\ln L(\mu) = -\ln\sqrt{2\pi} - \frac{\sum_{i=1}^{n}(x_i=\mu)^2}{2}$

$-l = \frac{(\mu-\mu_0)^2}{2\sigma_0^2} + \frac{\sum_{i=1}^{n}(x_i-\mu)^2}{2}$

$l' = \frac{(\mu-\mu_0)}{\sigma_0^2} + \sum_{i=1}^{n}(x_i - \mu) = 0$

$\mu - \mu_0 - \sum_{i=1}^{n}(x_i - \mu)\sigma_0^2 = 0$

$\mu = \frac{\mu_0+\sigma_0^2\cdot\sum_{i=1}^{n} x_i}{\sigma 2_0 \cdot n+1}$