$$\ln p(x|\lambda_1) = \ln p(x,z|\lambda_1) - \ln p(z|x,\lambda_1) \quad \text{— (I)}$$

$$\ln p(x|\lambda_2) = \ln p(x,z|\lambda_2) - \ln p(z|x,\lambda_2) \quad \text{— (II)}$$

(I) − (II)

$$\ln p(x|\lambda_1) - \ln p(x|\lambda_2) = \ln p(x,z|\lambda_1) - \ln p(z|x,\lambda_1) - \ln p(x,z|\lambda_2) + \ln p(z|x,\lambda_2)$$

$$\sum_{z\in Z} p(z|x,\theta_{j-1}) \left[\ln p(x,z|\lambda_1) - \ln p(x,z|\lambda_2)\right]$$

$$- \sum_{z\in Z} p(z|x,\theta_{j-1}) \left[\ln p(z|x,\lambda_1) - \ln p(z|x,\lambda_2)\right]$$

$$= \cancel{\sum_{z\in Z} p(z|x,\theta_{j-1}) \ln}\; Q(\lambda_1,\theta_{j-1}) - Q(\lambda_2,\theta_{j-1})$$

$$- \sum_{z\in Z} p(z|x,\theta_{j-1}) \ln \frac{p(z|x,\lambda_1)}{p(z|x,\lambda_2)}$$

At $\lambda_1 = \theta_j$, & $\lambda_2 = \theta_{j-1}$

$$\ln p(x|\theta_j) - \ln p(x|\theta_{j-1}) = Q(\theta_j,\theta_{j-1}) - Q(\theta_{j-1},\theta_{j-1})$$

$$- \sum_{z} p(z|x,\theta_{j-1}) \ln \frac{p(z|x,\theta_j)}{p(z|x,\theta_{j-1})}$$

$$\ln p(x|\theta_j^o) - \ln p(x|\theta_{j-1}^o) \geq Q(\theta_j^o, \theta_{j-1}^o) - Q(\theta_{j-1}^o, \theta_{j-1}^o)$$

$$\theta_j^o = \underset{\theta}{\operatorname{argmax}}\ Q(\theta, \theta_{j-1}^o)$$

$$\therefore\ Q(\theta_j^o, \theta_{j-1}^o) \geq Q(\theta_{j-1}^o, \theta_{j-1}^o)$$

$$\ln p(x, \theta_j^o) \geq \ln p(x|\theta_{j-1}^o)$$

I-step: $\theta = \theta_0$

E-step: Compute $p(z|x, \theta)$ at $\theta = \theta_0$.

$$Q(\theta, \theta_0) = \sum_z p(z|x, \theta_0) \cdot \ln p(x, z|\theta)$$

M-step: $\theta_t = \underset{\theta}{\operatorname{argmax}}\ Q(\theta, \theta_{t-1})$