1 Section A

(a)

We have the continuous random variable $M \in [5;5.6]$. Our model is the weighted sum of a background and signal such that:

$$p(M;f,\lambda,\mu,\sigma) = fs(M;\mu,\sigma) + (1-f)b(M;\lambda) \tag{1}$$

where:

$$s(M;\mu,\sigma) = \frac{1}{\sqrt{2\pi}\sigma}e^{-\frac{(M-\mu)^2}{2\sigma^2}}$$

$$b(M;\lambda) = \lambda e^{-\lambda M}$$

We want to show that:

$$I = \int_{-\infty}^{+\infty} p(M;f,\lambda,\mu,\sigma)\,dM = 1 \tag{2}$$

2 Section B