**Q1**

1. Because x, y are independent

According to bayes rule

For

Therefore

1. According to the note and independence

by using the outcome from part a, we can calculate the integral

Therefore

**Q2**

According to the note

EM algorithm

1. Initializing in some way
2. For iteration t = 1,2, …, T

(a)E-step: Calculate E = , where

(b)M-step: Update vector using the expectations above in the following equations

(c)Calculate using the equation

Here is one dimension of vector, since every dimension is the same

**Q3**

According to the note:

,

,

**Inputs**: Data and definitions and

**Outputs**: Values for

1. initialize in some way
2. For iteration t = 1,…,T

Update by setting

,

Update by setting

,

Evaluate L(to access convergence