**HW3 – Probability and Bayesian Stats – Due Tuesday 4 February**

Suppose you are studying a pair of cryptic species. In your area 5% of individuals are species A and 95% of individuals are species B. There is currently no genetic assay capable of telling them apart. They differ however in the frequency of a rare color pattern. Species A has the rare color pattern 50% of the time while species B has the rare color pattern only 2% of the time. Assume these numbers are known with certainty, from many years of field research.

1. Now suppose you find one of these species with the rare color pattern. Use Bayes theorem to compute the probability that it is from species A.
2. A new paper comes out that states that species B has a morphological feature 50% time that is only present 10% of the time in species A. Your sample has this feature. What is the probability that you have a sample of species A now?
3. Suppose now that a genetic test is developed that can identify the species of our sample. But the test, like all tests, is imperfect. This is the information you have about the test:
   1. The probability it correctly identifies species A is 0.7
   2. The probability it correctly identifies species B is 0.98

You run the test and it is positive for species A. Compute the posterior probability that your sample is species A using all the information available.

Prepare a document with your answers and R code you used to solve all five problems.