Part I

Consider the following data set with three Boolean predictive attributes, W, X, Y, and Boolean classification C.

W	X	Y	C
T	T	T	T
T	F	T	F
T	F	F	F
F	T	T	F
F	F	F	T

We now encounter a new example: $W = F$, $X = T$, $Y = F$. How should this example be classified using the Naive Bayes method? Show your computations.

$$P(W = F|C = T) \cdot P(X = T|C = T) \cdot P(Y = F|C = T) \cdot P(C = T) = \frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} \cdot \frac{2}{5} = \frac{1}{20} = 0.05$$

$$P(W = F|C = F) \cdot P(X = T|C = F) \cdot P(Y = F|C = F) \cdot P(C = F) = \frac{1}{3} \cdot \frac{1}{3} \cdot \frac{1}{3} \cdot \frac{3}{5} = \frac{1}{45} = 0.0222$$

The example should be classified as T.

Part II

Typically Naive Bayesian produces an approximate MAP hypothesis. What would be the approximate ML hypothesis?

$$P(W = F|C = T) \cdot P(X = T|C = T) \cdot P(Y = F|C = T) = \frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} = \frac{1}{8} = 0.125$$

$$P(W = F|C = F) \cdot P(X = T|C = F) \cdot P(Y = F|C = F) = \frac{1}{3} \cdot \frac{1}{3} \cdot \frac{1}{3} = \frac{1}{27} = 0.0370$$

The example should be classified as T.