Assignment 1

PART 3

x1	x2	y
0	0	T
0	0	T
1	0	T
1	0	T
0	1	F
0	1	F
1	1	T
1	2	T
0	2	F
1	2	F

Table 1

Question 1: What is the entropy of this collection of training examples with respect to the target class? (3 points)

$$Entropy_{parent} = -\sum_{i=0}^{c-1} p_i(t) \log_2 p_i$$

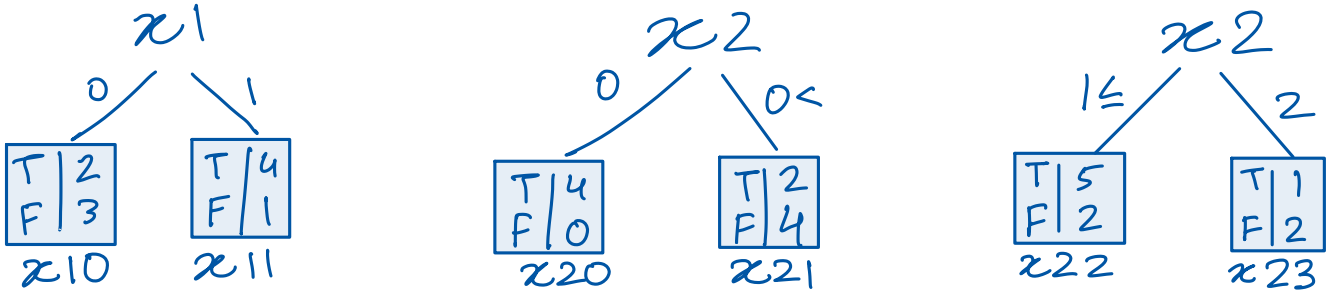
C1 (T)	6
C2 (F)	4

Parent

$$= -\left(\frac{6}{10}\right)\log_2\left(\frac{6}{10}\right) - \left(\frac{4}{10}\right)\log_2\left(\frac{4}{10}\right)$$

$$= 0.971$$

Question 2: What are the different options for the first split when constructing your decision tree? (3 points)



Question 3: For each potential first split option, compute the information gain. Only provide the results, there is no need to provide your calculations (3 points).

Instance Entropy		Weighted Entropy	Gain
$E_{x10} = 0.971$	$E_{x11} = 0.722$	WE = 0.8465	0.1245
$E_{x20} = 0$	$E_{x21} = 0.9183$	WE = 0.5509	0.42002
$E_{x22} = 0.86312$	$E_{x23} = 0.9183$	WE = 0.8796	0.0913

Question 4: Build the complete decision tree based on the given specifications and training set. The representation of the tree should adhere to the style used in the lecture notes of this course. (6 points)

This tree is a complete decision tree of the one that gives us the most gain based on the first split.