1. The plot below represents the predictor space (on X_1 and X_2) with a training data set plotted and the class of their response variable indicated by the color.

   (a) If we consider this a classification tree without any splits yet (i.e. only one region), what would be the prediction for *every* new observation?

   (b) What is the (training) misclassification rate?

   (c) What is the GINI index?

   (d) What is the cross-entropy?

2. Add a straight line, parallel to one of the axes, that splits the predictor space into two regions. Choose the split in a way that you think will lead to the best overall improvement in the metrics above. Label the new regions R_1 and R_2 and calculate the metrics for each.

R_1	R_2
(a) What is the predicted class?	(a) What is the predicted class?
(b) What is the misclassification rate?	(b) What is the misclassification rate?
(c) What is the GINI index?	(c) What is the GINI index?
(d) What is the cross-entropy?	(d) What is the cross-entropy?

3. To decide if the split in Q2 was optimal, we need to evaluate how much the metrics in Q1 have improved. This requires combining the metrics across R_1 and R_2 in Q2. Please do so in a sensible way so that you can answer: what was the overall decrease each metric going from one region/node to two?

   Misclassification: GINI: Cross-entropy:

4. On the back of this page, please draw the (very simple) tree corresponding to your partition.