Name:

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| --- | --- | --- |
| Problem | Points | Score |
| 1(a) | 20 |  |
| 1(b) | 20 |  |
| 2(a) | 20 |  |
| 2(b) | 20 |  |
| 3 | 20 |  |
| Total | 100 |  |

Notes:

1. The exam is closed books and notes except for one double-sided sheet of notes.
2. Please indicate clearly your answer to the problem.
3. If I can’t read or follow your solution, it is wrong and no partial credit will be awarded.

**Problem No. 1**: Let  for a two-category one-dimensional problem with 

1. Show that the minimum probability of error is given by:  where .
2. Use the inequality  to show that  goes to zero as  goes to infinity.

**Problem No. 2**: Given a two-class two-dimensional classification problem (x = {x1,x2}) with the following parameters (uniform distributions):



where 

1. Write the Bayes decision rule for this case (hint: draw the decision boundary). Is this solution unique? Explain.
2. Compute the probability of error.

**Problem No. 3**: Let x have a uniform density: . Suppose that n samples  are drawn independently from . Derive an expression for the maximum likelihood estimate of *θ*. Hint: compute the likelihood of the data given *θ* and differentiate. Discuss what happens to this estimate as .