HOMEWORK ASSIGNMENT #4

Due Wed. Apr. 28, 2004 (in class)

1. This problem uses the Titanic data from Homework 1 (i.e., `hw1dat`).
   (a) Compute the theoretical ROC curve given that $p_0(y) = U[-1.5, 1.5]$ and $p_1(y) = \frac{1}{2}\mathcal{N}(-2, 1) + \frac{1}{2}\mathcal{N}(2, 1)$. What is the size-0.3 NP decision rule and the resulting P_D?
   (b) Using an LRT rule with the same form as part (a), we will empirically design Neyman-Pearson tests to achieve particular false-alarm rates. Varying the threshold in the LRT rule, plot the estimated ROC curve (i.e., P_D vs. P_F) using *only the first 200 points of* the H_0 and H_1 data columns. What is the size-0.3 NP decision rule and the resulting P_D?
   (c) Comment on your results and any issues to empirically designing a Neyman-Pearson test with limited data.
2. Poor, II.20.
3. Poor, III.3. (*Hint:* Recall the M-ary Bayes problem, and the fact that minimum-error-probability implies a particular cost assignment.)
4. Poor, III.9. (For the LMP stated in part (b), you can ignore the randomization γ since it is not needed.)
5. Poor, III.11. Replace the equation before (III.B.82) in the text with
$$\sum_{k=1}^{n} a_{jk} a_{lk} \sin[2(k-1)\omega_c T_S + \theta] = 0 \quad \forall j, l, \theta.$$
6. Poor, III.12. (Hint: Use the "catalyst" idea discussed on p. 74 of the text.)