Biostatistics 615/815
Problem Set 8
Due November 24, 2004

1. Consider the following set of 20 observations drawn from a mixture of two normal distributions.

-2.876	-0.877	0.728	1.670
-2.527	-0.645	0.737	1.826
-1.213	0.151	0.819	1.867
-1.111	0.246	0.998	2.107
-1.034	0.409	1.602	2.618

Assuming that the two distributions have unit variance and symmetric means Δ and –Δ, the likelihood function for these data is:

$$L(\Delta) = \prod_i \frac{1}{\sqrt{2\pi}} \left(e^{-\frac{1}{2}(x_i - \Delta)^2} + e^{-\frac{1}{2}(x_i + \Delta)^2} \right)$$

(The product should be calculated over all observations).

Write a program that:

a) Brackets the maximum of the log-likelihood function.

b) Using the golden-section optimization strategy, finds the MLE for Δ.

c) Using an optimization strategy based on parabolic interpolation, finds the MLE of Δ.

d) How many function evaluations did you need for steps a), b) and c) above?