STAT 740 - Spring 2004 - Homework 5
Due: Friday, April 2nd

Consider the case of a "logistic" regression with positive slope $a>0$ and with lower and upper asymptotes $0 \le d < g \le 1$.

$$P(Y=1) = d + \frac{g-d}{1+\exp(-(ax+b))}$$

for a sample (x_i, y_i) for $1 \le i \le n$.

a) Find the likelihood function $L(a,b,d,g \mid \underline{x}, \underline{y})$ and log-likelihood function.

b) Enter the negative log-likelihood function in R in the form `function(pars)` so that it can be used for constrained optimization. (Recall that the x and y cannot be arguments of the function).

c) Find the form of the linear constraints as used for the adaptive boundary method.

d) Find the estimates of the parameters for the following data set with 10 observations at each of the *x* values. (Using `c` and `rep` might be the easiest way to enter it.)

x	-3	-2	-1	0	1	2	3
# *y*=1	2	3	3	5	8	9	8
# *y*=0	8	7	7	5	2	1	2

e) On the same graph, plot both the estimated logistic function and the observed probability of a 1 at each *x* level (e.g. .2 at –3, .3 at –2, etc…). Does the fitted function seem to match the data very well?