In regard to #5 on the 11th problem set, see the graph.
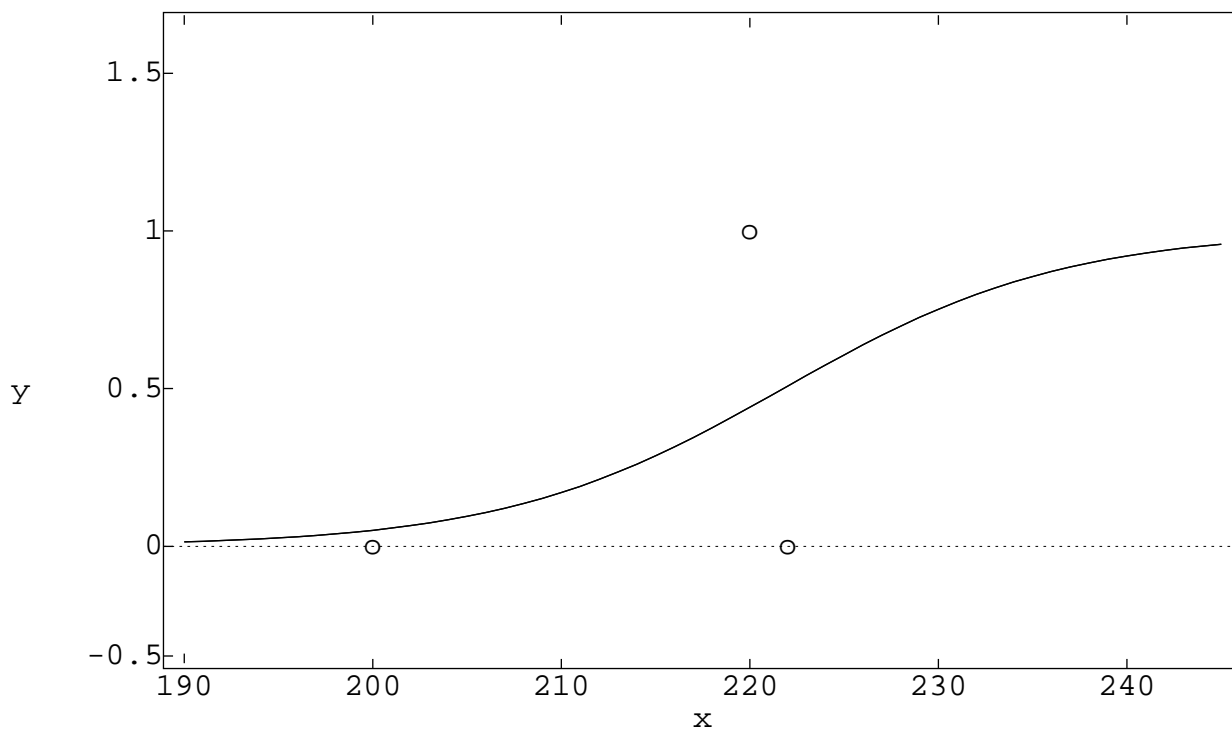
The logistic curve must either
approach 1 as x goes to infinity and approach 0 as x goes to minus infinity, or
vice versa, or
remain constant.

The best-fitting such curve has a y-value near 1/2 when x is 221, because half of the observed y-values in that vicinity are 1 (and the other half are zero). It has a y-value near 0 when x is 200, since the one y-value in that vicinity is 0. One could achieve a better fit near 200 that makes the y-value there even closer to 0, but only at the expense of making the curve much steeper near 221, so that it would be closer to 1 at 222 (making the fit worse at that point) and closer to 0 at 220 (also making the fit worse at that point).

Alpha is positive since the y-value of 1/2 near x=221 is bigger than the y-value of 0 near x=200, so y increases as x increases.