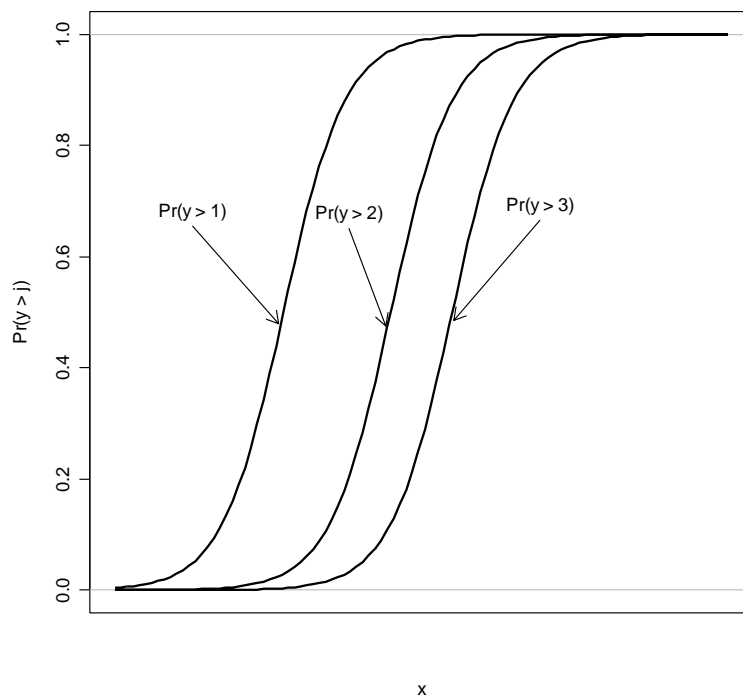


## Session 6: Exercises

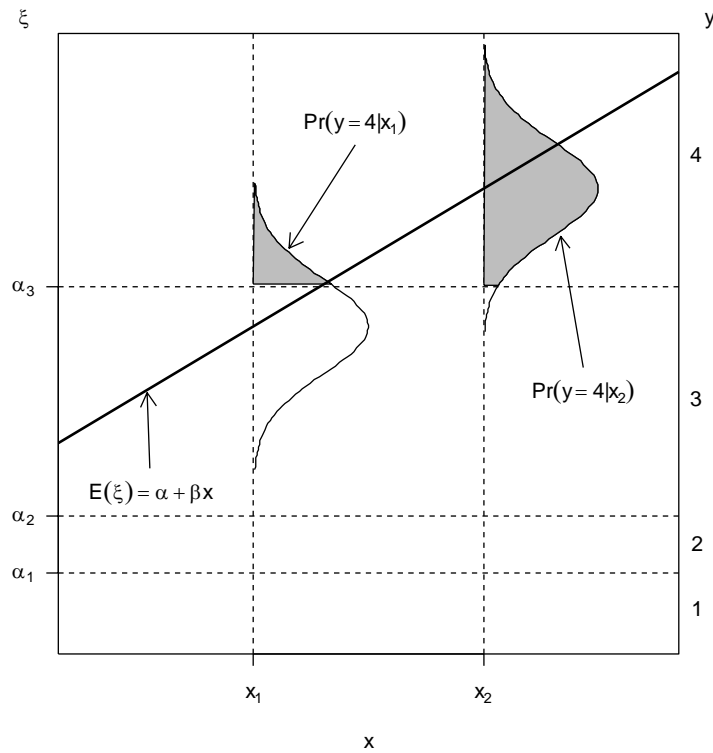
The two graphs reproduced below are meant to explicate the proportional-odds logistic regression model, described on pp. 175-177 of Fox, *An R and S-PLUS Companion to Applied Regression*. In these graphs, there is a single predictor variable,  $x$ , and a four-category ordinal response variable  $y$ .



This first graph is similar to Figure 5.5 in Fox and is relatively simple to construct.

*Some hints:*

- You can use the following function to compute cumulative logistic probabilities:  
`plogit <- function(x) 1/(1+exp(-x))`
- Use the mouse to find coordinates for arrows and labels, as illustrated in the R script for this session.



This is a much more challenging graph, similar to Figure 9.2 in Agresti's *Categorical Data Analysis* (Wiley, 1990). The left vertical axis gives the latent continuous response variable  $\xi$ , with cut points  $\alpha_1$ ,  $\alpha_2$ , and  $\alpha_3$ , while the right vertical axis gives the observed ordinal response variable  $y$ , with values 1, 2, 3, and 4. The graph shows the regression line, along with the probability that  $y = 4$  at two different  $x$ -values.

*Hints:*

- All of the techniques required for constructing this graph were covered in class.
- I used the normal density function `dnorm()` to draw the curves, figuring that this would be visually indistinguishable from using the logistic density.
- Most of the text in the graph was positioned with the mouse. Remember that you have to set the argument `xpd=TRUE` in a call to `text()` to write outside of the plotting region.