The two graphs reproduced below are meant to explicate the proportional-odds logistic-regression model, described in Section 5.9 of the *R Companion*. In these graphs, there is a single predictor variable, $x$, and a four-category ordinal response variable $y$. Try to duplicate these graphs using R.

The first graph is similar to Figure 5.8 in the R Companion and is relatively simple to construct. Some hints:

- You can use the `plogis()` or the similar `pnorm()` function to compute cumulative logistic probabilities.
• You can use the mouse to find coordinates for the arrows and the text labeling the curves.

The second diagram is a much more challenging graph, similar to Figure 9.2 in Agresti’s *Categorical Data Analysis* (Wiley, 1990), but nicer! The left vertical axis gives the latent continuous response variable \( \xi \), with thresholds at \( \alpha_1 \), \( \alpha_2 \), and \( \alpha_3 \), while the right vertical axis gives the observed ordinal response variable \( \varphi \), with values 1, 2, 3, and 4. The graph shows the regression line, along with the probability that \( \varphi = 4 \) at two different \( x \)-values. Hints:

• All of the techniques required for constructing this graph were covered in the workshop and in Chapter 7 of the *R Companion*.

• I used the normal density function `dnorm()` to draw the curves, figuring that this would be visually indistinguishable from using the logistic density, but you could also use `dlogis()`.

• 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. An alternative would be to use `mtext()` to place the text in the plot margins.