

**Exer 4.4**

[S2008/S2008-lang2]

Using your general knowledge about the world, think about the relationship between these variables:

- speed of a bicyclist.
- steepness of the road, a quantitative variable measured by the grade (rise over run). 0 means flat, + means uphill, – means downhill.
- fitness of the rider, a categorical variable with three levels: unfit, average, athletic.

Sketch out a graph of speed versus steepness for reasonable models of each of these forms:

1. Model 1:  $\text{speed} \sim 1 + \text{steepness}$
2. Model 2:  $\text{speed} \sim 1 + \text{fitness}$
3. Model 3:  $\text{speed} \sim 1 + \text{steepness} + \text{fitness}$
4. Model 4:  $\text{speed} \sim 1 + \text{steepness} + \text{fitness} + \text{steepness}:\text{fitness}$