

## Topic 5 problems: cue combination

1. What is the maximum likelihood cue combination rule for three cues  $D_1$ ,  $D_2$ , and  $D_3$ , with standard deviations  $\sigma_1$ ,  $\sigma_2$ , and  $\sigma_3$ , respectively? Take a similar approach to the one we used for two cues.
2. (A harder problem.) Derive the maximum likelihood cue combination rule without using the fact (which we relied on in class) that a pointwise product of Gaussians is also a Gaussian. You can do this by following these steps.
  - (a) Write down the formula for the likelihood of a depth estimate  $d$ , given measurements from two cues,  $x_1$  and  $x_2$ . We want to find the value of  $d$  that maximizes this expression.
  - (b) Remove scale factors and use monotonic transformations (e.g.,  $\log(x)$ ) to turn the expression you wrote down in (a) into a simpler expression that has the same maximum. (Hint: you should be able to turn it into a polynomial.)
  - (c) Take the derivative of the expression in (b).
  - (d) Solve the equation that says the expression in (c) is zero.