

Problem 1 Draw a graph of the probability of having a disease given a positive test, as a function of:

- (a) The test sensitivity (true positive rate). Assume a fixed false positive rate of 5% and plot graphs for both a rare (1% prevalence) and a common (10% prevalence) disease.
- (b) The false positive rate. Assume a fixed sensitivity of 90% and plot graphs for both a rare (1% prevalence) and a common (10% prevalence) disease.
- (c) The disease prevalence. Assume a 90% sensitivity and 5% false positive rate.

To plot the graphs you can use <https://www.desmos.com/calculator> (unless you have statistical software on your laptop, in which case use whatever you'd like)

Problem 2 Let θ be the rate of support for the Lib Dems in the general population. Using a $Beta(1.5, 20)$ distribution as your prior, calculate the posterior distribution of θ after seeing the following opinion poll data:

$N = 100$, intending to vote LD = 19

$N = 100$, intending to vote LD = 17

$N = 100$, intending to vote LD = 16

Graph the posterior after seeing each poll to see how it changes. You can use this online tool <https://homepage.divms.uiowa.edu/~mbognar/applets/beta.html>
