QUESTION 2

2a) $\boxed{A, C}$

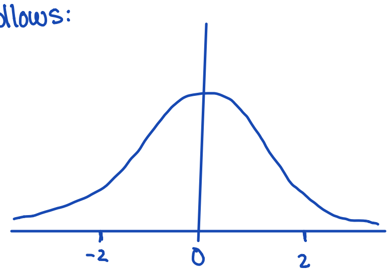
Previously, I thought the answer was only A, the Bonferroni method. This is because Bonferroni controls FWER. We also know $FDR \leq FWER$. So FDR is controlled too. What I missed was the LORD algorithm, which controls FDR by definition.

QUESTION 4

4a) $\boxed{C, D, E}$

Previously, I had chosen C and D.

What I didn't realize was that E is also capable of generating proposals between -2 and 2. This is because Normal(0,1) distribution can be represented as follows:



Hence, Normal(0,1) can also generate proposals between -2 and 2.

QUESTION 5

5b) $\boxed{A}$

Previously, I chose B. I recognized that $\frac{a}{a+b}$ should be large because carts are more likely than baskets so the mean of the prior distribution should be large. However what I failed to recognize was that we want carts to be "much more" likely than baskets, which means that we want a much stronger prior.

For A: $\frac{a}{a+b} = \frac{30}{30+1} \approx 0.967$

For B: $\frac{a}{a+b} = \frac{3}{3+1} \approx 0.75$

Therefore, the correct answer is A because the mean of the prior is larger than in B.

5d) Even though I reached the correct answer, I did not set up Bayes' rule in the first step correctly. I should have written:

$$P(\theta_c, \theta_b, \theta_n \mid x_1, \dots, x_n) \propto P(\theta_c, \theta_b, \theta_n)\left[\prod_i P(x_i \mid \theta)\right]$$

Instead, I wrote:

$$P(\theta_c, \theta_b, \theta_n \mid x_i) \propto P(\theta_c, \theta_b, \theta_n)\left[P(x_i \mid \theta)\right]$$

This was because I forgot to explicitly specify that this relationship was going to hold true for ALL x_i. This would introduce the multiplication of <u>all</u> x_i i.e $\prod_i P(x_i \mid \theta)$ instead of $P(x_i \mid \theta)$.

After this, my next steps were correct as follows:

$$\begin{aligned} P(\theta_c, \theta_b, \theta_n \mid x_1, \dots, x_n) &\propto P(\theta_c, \theta_b, \theta_n)\left[\prod_i P(x_i \mid \theta)\right] \\ &\propto \theta_c^{\alpha_c}\theta_b^{\alpha_b}\theta_n^{\alpha_n}\left[\theta_c^{N_c}\theta_b^{N_b}\theta_n^{N_n}\right] \\ &\propto \theta_c^{\alpha_c+N_c}\theta_b^{\alpha_b+N_b}\theta_n^{\alpha_n+N_n} \end{aligned}$$

$$= \text{Drichlet}(\alpha_c + N_c, \alpha_b + N_b, \alpha_n + N_n)$$