Computer Assignment #2

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Question 1 - Item Response Functions and Person Estimates

**(a) Which item was the easiest item and which item was the hardest? (2 points)**

Item 10 is the hardest (red colored) one and item 5 is the easiest (green colored)

Discrimination Difficulty Guessing

Item 1 1 -1.40938612 0

Item 2 1 -0.35055656 0

Item 3 1 -0.90318970 0

Item 4 1 -0.97412011 0

Item 5 1 -1.62671110 0

Item 6 1 0.02533657 0

Item 7 1 -0.41418545 0

Item 8 1 -0.87993298 0

Item 9 1 -0.91498121 0

Item 10 1 0.52959427 0

Item 11 1 -1.17125435 0

Item 12 1 -0.04749604 0

Item 13 1 0.15008663 0

Item 14 1 -0.74253017 0

Item 15 1 -0.74245332 0

Item 16 1 0.36963876 0

Item 17 1 -0.84513136 0

Item 18 1 -1.45145349 0

**(b) Provide a 95% confidence interval for the easiest item and interpret it. (2 points)**Discrimination SE Difficulty SE Guessing SE

Item 1 NA 0.1267448 0

Item 2 NA 0.1128011 0

Item 3 NA 0.1178581 0

Item 4 NA 0.1188426 0

**Item 5 NA 0.1320051 0**

Item 6 NA 0.1118476 0

Item 7 NA 0.1131572 0

Item 8 NA 0.1175527 0

Item 9 NA 0.1180162 0

Item 10 NA 0.1136598 0

Item 11 NA 0.1220123 0

Item 12 NA 0.1118797 0

Item 13 NA 0.1119630 0

Item 14 NA 0.1159197 0

Item 15 NA 0.1159189 0

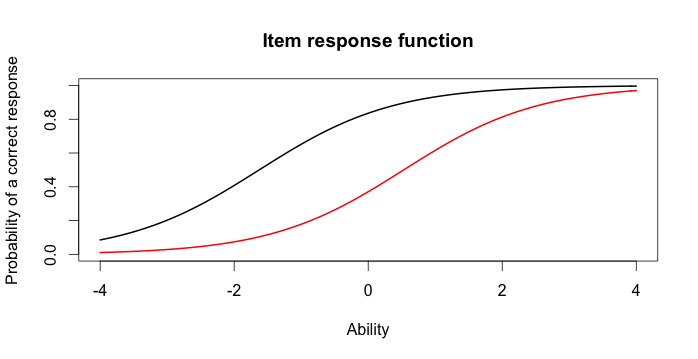
Item 16 NA 0.1126941 0

Item 17 NA 0.1171115 0

Item 18 NA 0.1276902 0

-1.62671110 +/- 1.96 \* 0.1320051 = 1.367981004 / -1.885440996 which indicate that there is 95% chance that the confidence interval contains the item difficulty mean which lies between -1.885440996 and 1.367981004

**(c) Provide a plot that contains both the easiest and the hardest item. (1 point)**

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The black line is the easiest item and the red line is the hardest. Ability estimate for the black line is approximately -2. For the red line it would be around 0.8

**(d)  What would we expect the probability of a correct response would be for someone who had an ability score of 0 for these two items? (2 points)**For the black line we would expect the probability of a correct response that had an ability score of 0 would be 0.87 and for the red line is 0.38.

**(e)  What was the score of the person who did the best on the test? What was the score of the person who did the worst on the test? (2 points)**

The score of the person who did the best on the test was 3.999921 and the score of the person who did the worst was : -3.999947.  
  
> min(est\_abl$est) # Prints the minimum score [1] -3.999947 > max(est\_abl$est) # Prints the maximum scores [1] 3.999921 f) -0.6390908 +/- 1.96 \* 0.492458 =

Min: -3.999947  
Max: 3.999921

**(f)  Provide a 95% confidence interval for the estimated ability for the student who did the best on the test and interpret it. (2 points)**3.999921 + 1.96 \* 2.204373 = 8.32049208  
3.999921 - 1.96 \* 2.204373 = 0.32065008  
Which indicate that there is 95% chance that the confidence interval contains true ability score mean which lies between 8.32049208 and 0.32065008

est sem n

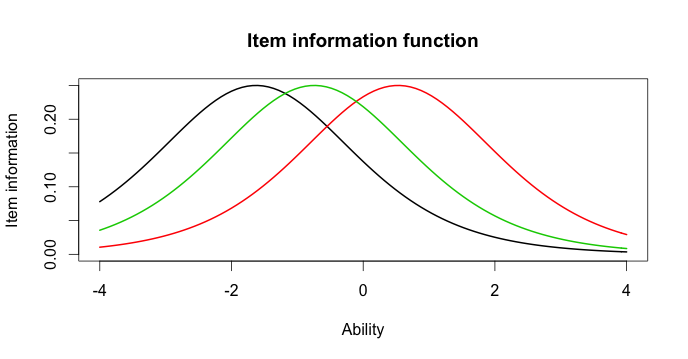
200 -0.6390908 0.492458 18

**Question 2 - Information**

For this question, you will choose three items to investigate.

**(a)  Please state the three items you selected. (1 point)**

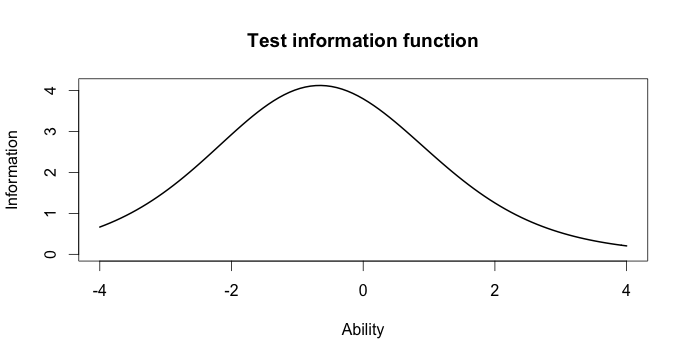
I chose item 5, 10 and 15.

**(b)  Provide a plot that contains these three items’ information functions. (1 point)**

**(c)  What is the same about these items’ information functions? What is different? Hint: This can be a very short answer. (2 point)**

The curve is all the same but where they are located is the difference between them.

**(d)  Provide a plot of the test information function. (1 point)**



**(e)  Where is the majority of the information for this test located? (1 point)**

From -1 to

**Finally, you will need to run a 2-PL.**

Question 3 - Comparing the 2-PL

**(a)  Which item had the highest discrimation? Which one had the lowest discrimination? (2 point)**Item 8 has the highest discrimination (2.2881772) and Item 12 has the lowest discrimination (0.3329130).

Discrimination Difficulty Guessing

Item 1 0.6326689 -2.00058101 0

Item 2 1.5469622 -0.26815483 0

Item 3 1.2534918 -0.77297206 0

Item 4 0.9842598 -0.97706755 0

Item 5 1.6407242 -1.19389580 0

Item 6 1.4702029 0.01833431 0

Item 7 0.5632837 -0.65124651 0

Item 8 2.2881772 -0.56753253 0

Item 9 1.8004066 -0.64761748 0

Item 10 1.1142107 0.48542889 0

Item 11 1.0344119 -1.13363005 0

Item 12 0.3329130 -0.12951933 0

Item 13 0.3369968 0.36344671 0

Item 14 0.6608229 -1.01479867 0

Item 15 1.5980393 -0.55640285 0

Item 16 1.0362116 0.35459121 0

Item 17 1.8591845 -0.59017915 0

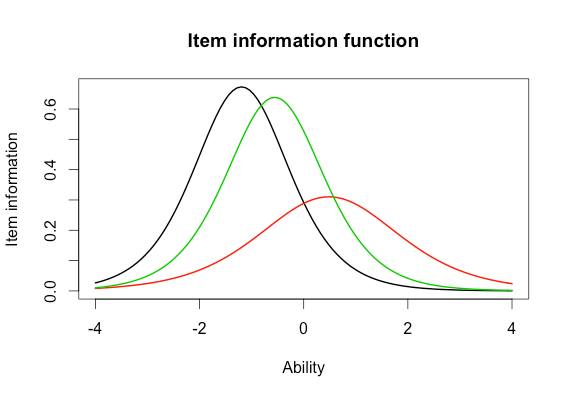
Item 18 1.2808752 -1.22177042 0

**(b)  Are the items that were the easiest and hardest in the Rasch model, also the easiest and hardest  in the 2-PL? (1 point)**

In both Rasch model and easiest model indicates that the item 10 is both the hardest item. But Rasch model indicates that the item 5 is the easiest and 2-PL indicates that the 1 item is the easiest.

**(c) What is the correlation between the ability estimates on the Rasch model and the 2-PL? If your interest was solely on estimating person abilities, do you think you would draw the same conclusions from both models? Why? (2 point)**

0.9709497 is the correlations between the ability estimates on the Rasch model and the 2-PL. Which indicates that if an individual gets a high score on this test, it get most likely high score on the next test. Yes, I could draw the same conclusion for both models because the correlation is so high, it is almost 1.

**(d)  Provide a plot of the item information function for the three items you selected in Question 2 but this time for the 2-PL model. (1 point)**

**(e)  For the 2-PL model, how do the item information functions for these items differ? How do the 2-PL item information functions from these items differ from their Rasch item information functions? (2 point)**

The red line has the widest range and a small information. The red line has the lowest discrimination. The black one has the highest item information but the green one has slightly lower item information than the black line. Black line has also the highest discrimination. The green line has a bit more discrimination than the black one. The black line has the most information about the item difficulty and red one has the least because it is wide. The black one is the easiest question. 2-PL : Item 8 has the highest discrimination (2.2881772) and Item 12 has the lowest. The lines in plot 1 (to the left here below, Rasch) is more wider than the green and black lines in the other plot. The red line in the plot to the right is most similar to the plot to the left than the green and black line. On the plot to the left, the item information for each line is different but it is the same at the plot to the left. However, the ability estimate for both plots is the same.

