E-411 PRMA

LECTURE 9 & 10 - ITEM RESPONSE THEORY

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ITEM ANALYSIS

ISSUES IN TEST DEVELOPMENT

ALTERNATIVES TO ITEM ANALYSIS

TEST REVISION

STANDARDIZATION

REVISING OLD TESTS

CROSS- AND CO-VALIDATION

TODAY

Item Response Theory

REVIEW

Classical Test Theory

CRITIQUES OF CTT

- Person are measured on number correct
- Score dependent on number of items on a test and their difficulty
- Scores are limited to fixed values
- Scores are interpretable on a within-group normative basis
- SEM is group dependent and constant for a group
- Item and person fit evaluation difficult
- Test development different depending on type of test

ITEM RESPONSE THEORY RATIONALE

WHAT IS ITEM RESPONSE THEORY?

## A measurement perspective

GENERALIZED ANXIETY DISORDER

- Anxiety could be loosely defined as feelings that range from general uneasienss to incapcitating attacks of terror

- Is anxiety latent and is it continuous, categorical, or both?

HOW TO MEASURE GENERALIZED ANXIETY?

- Used observed (i.e. **manifest variables**) that provide a proxy of generalized anxiety
- These provide our **operationalized definition** of generalized anxiety
- But how do we put these observed measures onto the generalized anxiety scale?

# PROPERTIES OF IRT

ASSUMPTIONS OF IRT
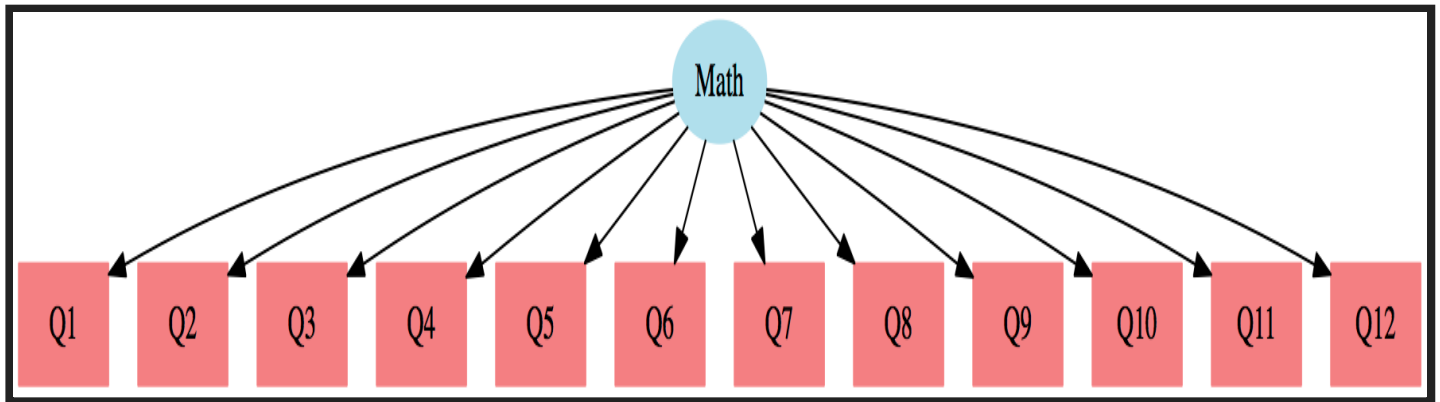
ITEM PARAMETERS

OTHER TRAITS OF IRT

- Use test information function for designing a test
- Has methods for examing item fit for identifying items that misfit
- Has methods for examing person fit for identifying persons that misfit
- Adaptive testing can be implemented (e.g. CAT)
- IRT is a family of models for various response types and could be used with multidimensional data.

IRT CONCEPTUALLY
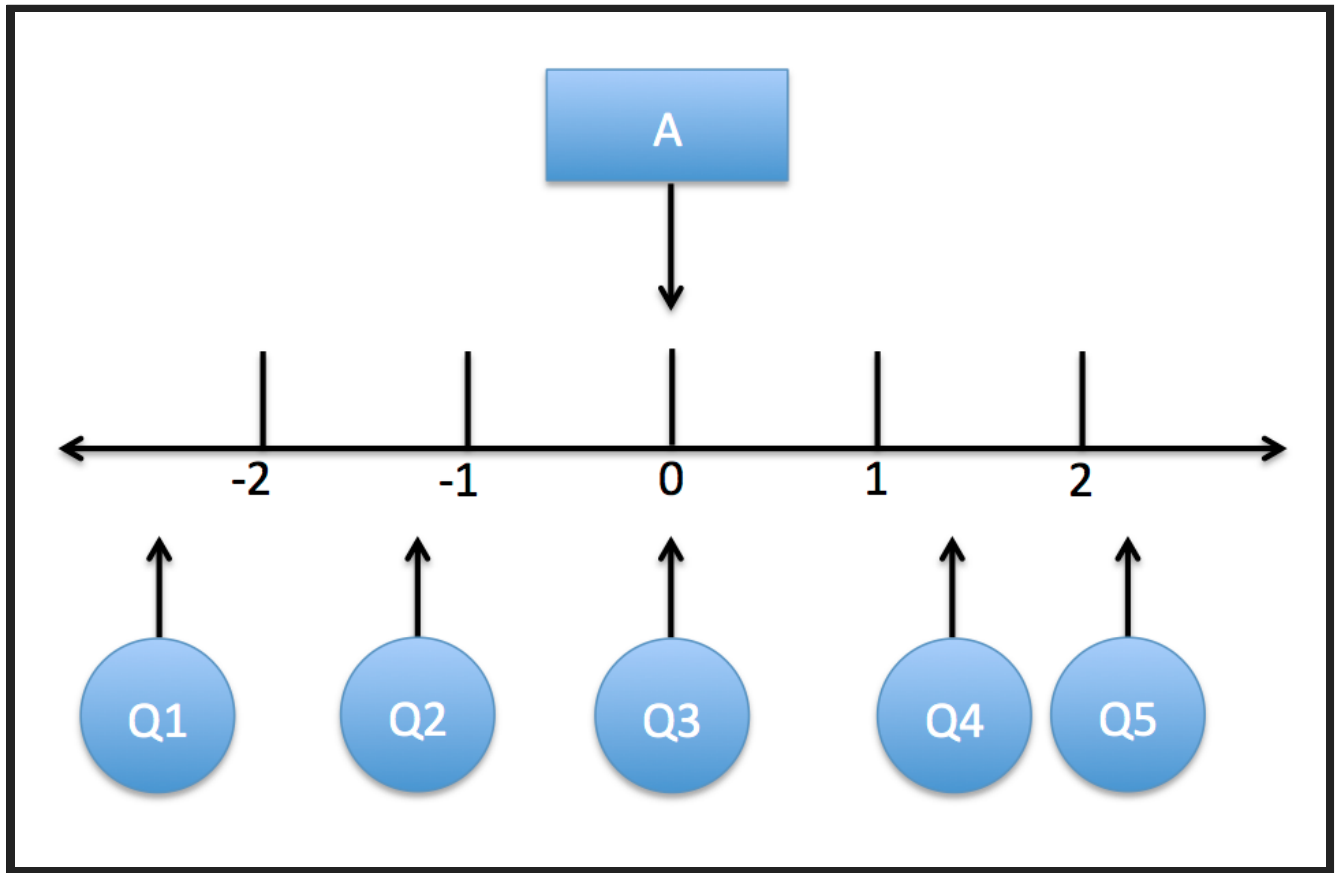
ITEM RESPONSE FUNCTION (IRF)
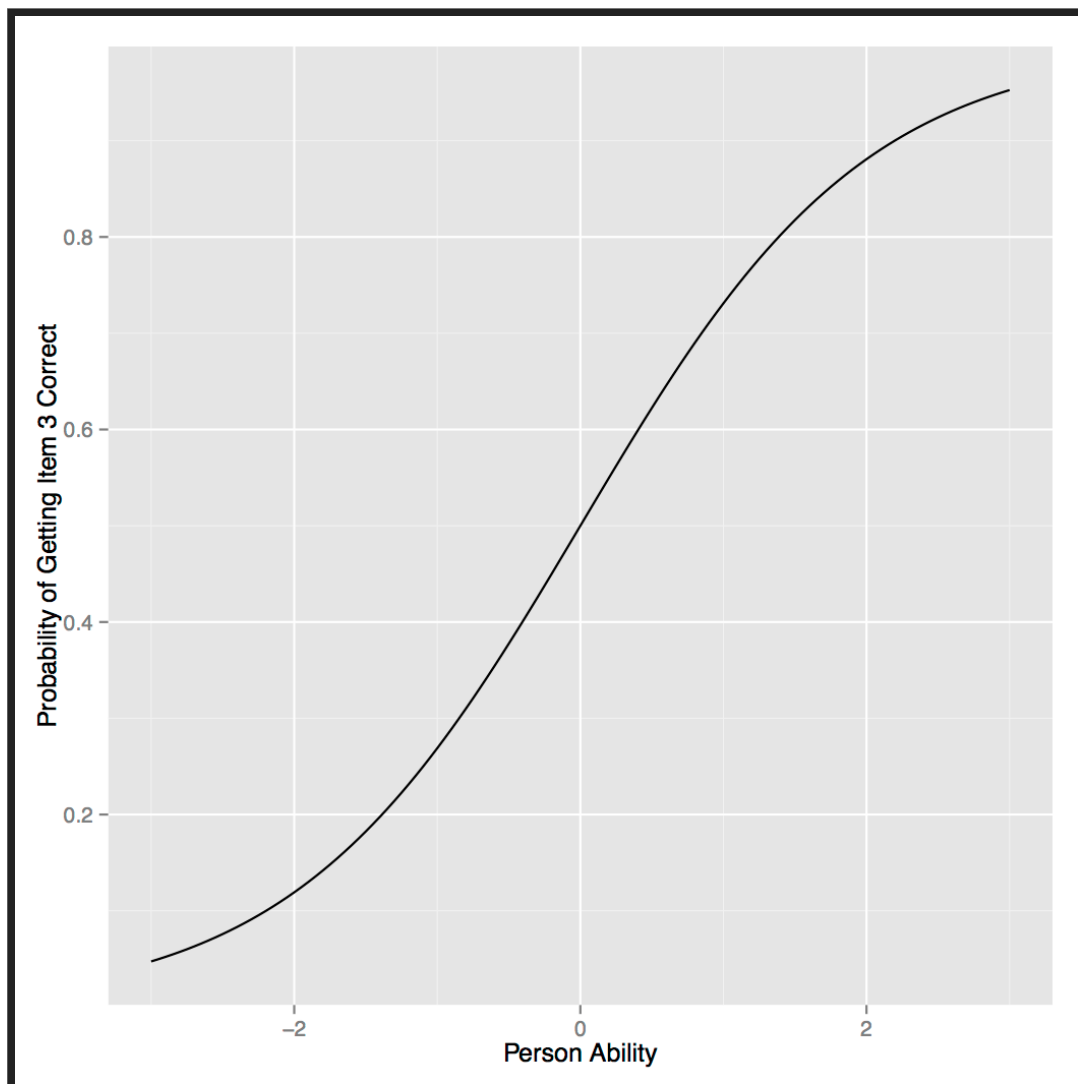
THE RASCH MODEL

WHAT DOES $\theta - b_j$ MEAN

```
rasch <- function(person, item) {
exp(person - item\) (1 + exp(person - item))
}
rasch(person = 1, item = 1.5)
# [1] 0.3775407

rasch(person = 1, item = 1)
# [1] 0.5
```

https://lundinn.shinyapps.io/rasch

shinyapps.io

https://lundinn.shinyapps.io/twopl

shinyapps.io

# https://lundinn.shinyapps.io/threepl

shinyapps.io

GETTING ITEM CORRECT RECAP

For the 1-PL and the Rasch, the probability of getting an item correct is a function of the distance an item is located from a person.

For the 2-PL, this is also a function of how well the item differentiates among people at different locations.
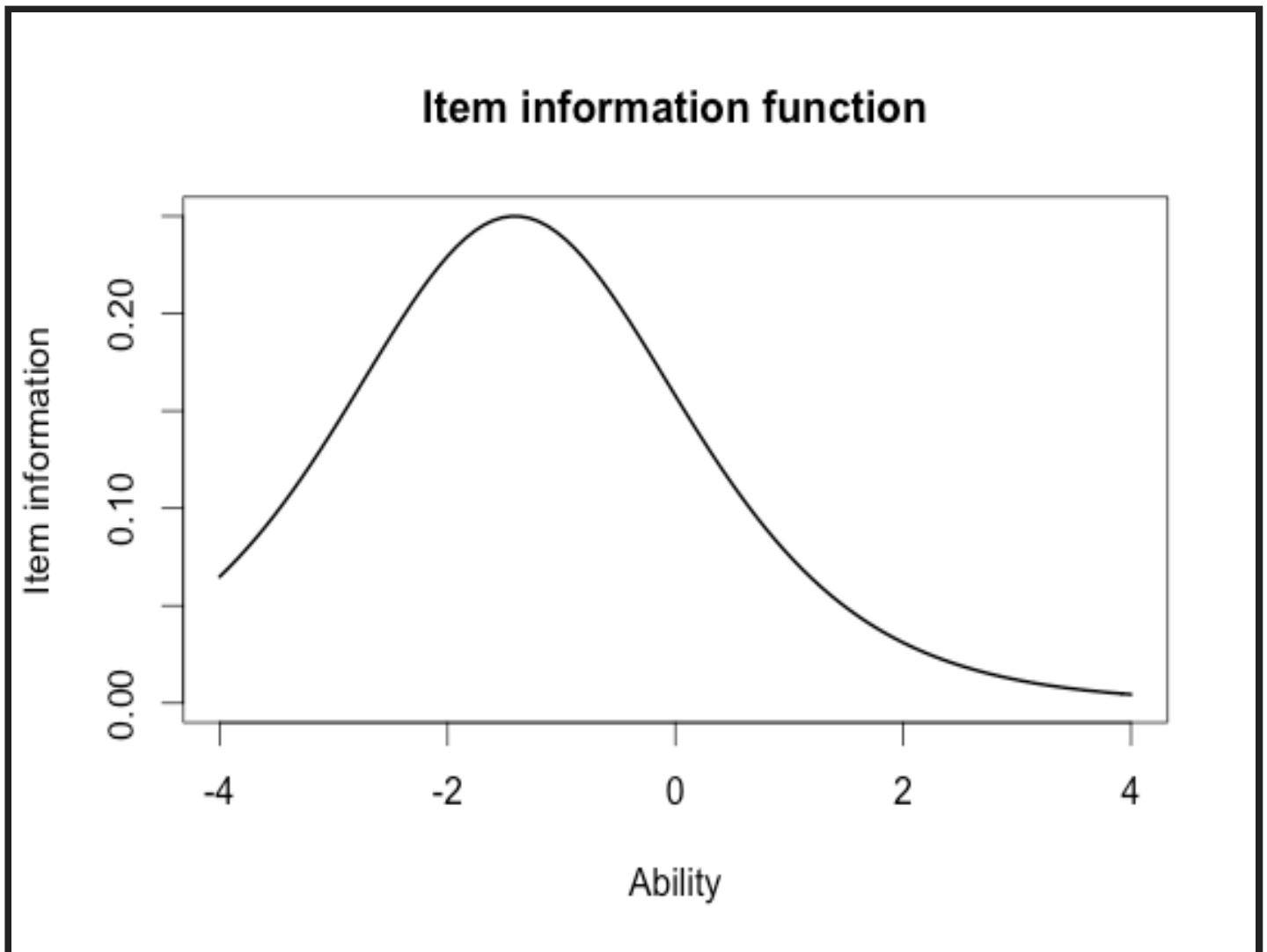
For the 3-PL, include item difficulty, item discrimination, and guessing
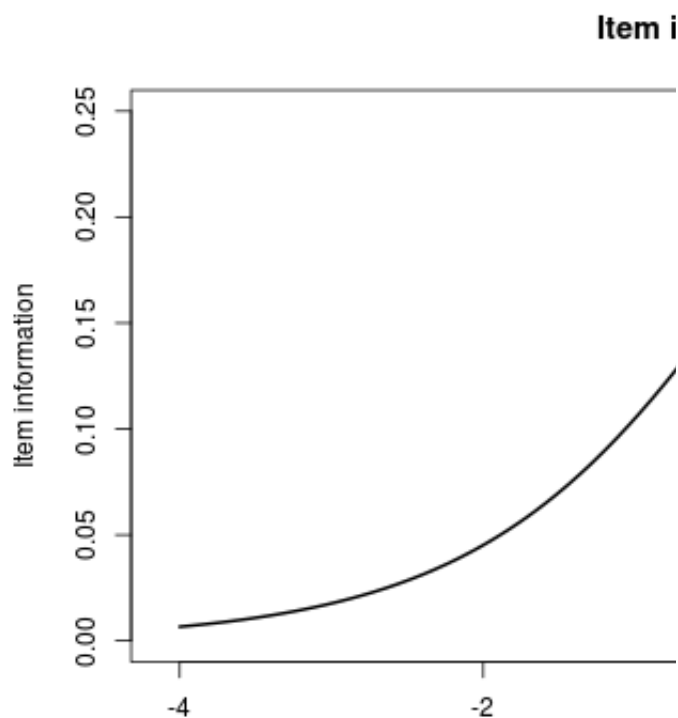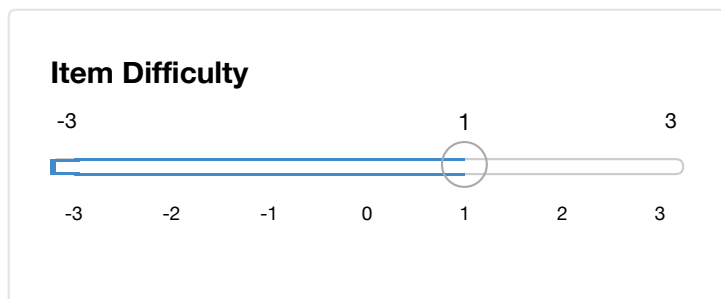
GUESSING PARAMETER
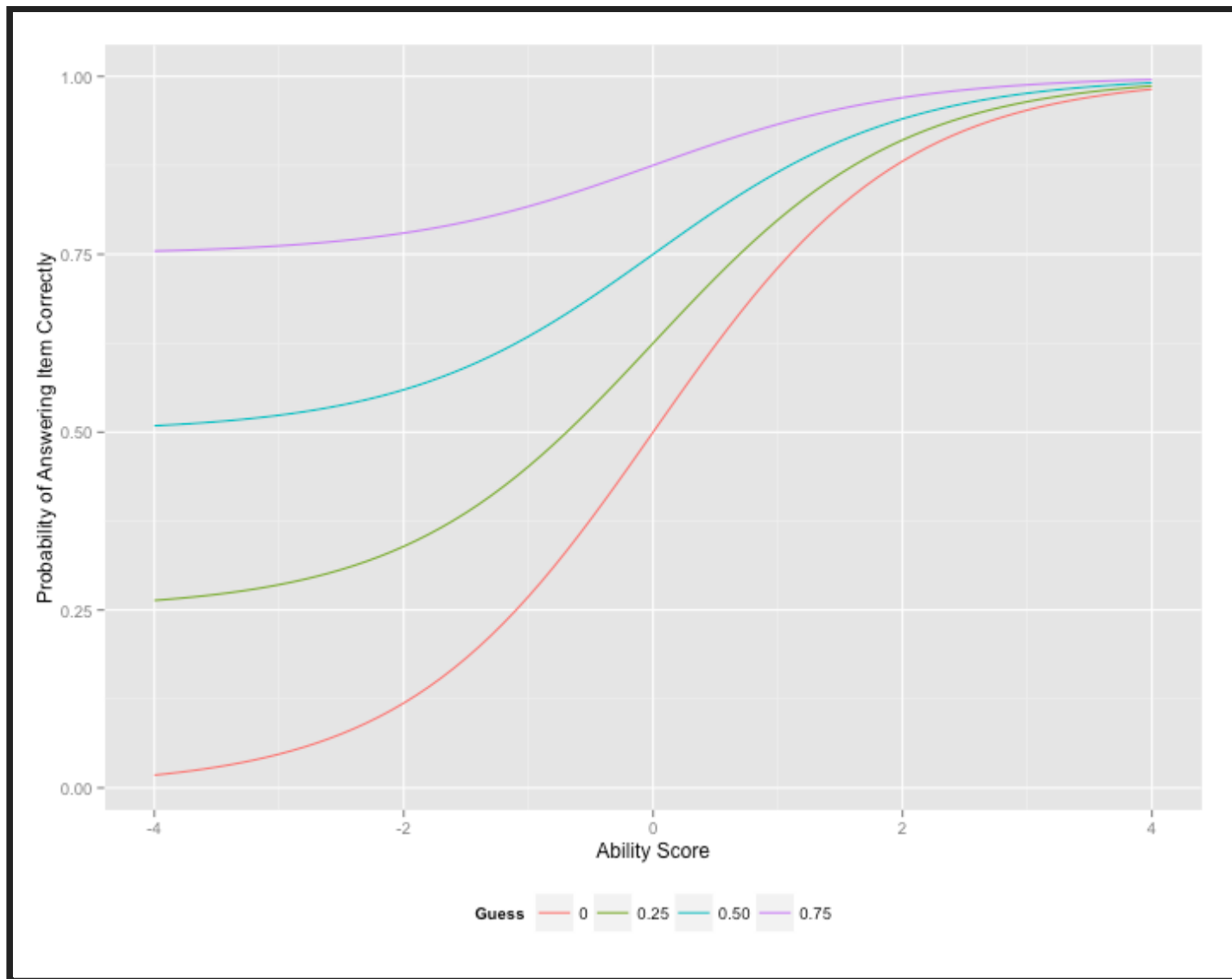
STANDARD ERROR OF ESTIMATE AND INFORMATION

ITEM INFORMATION FUNCTION

http://130.208.71.121:3838/rasch_informatic

Rasch Information

Item Difficulty

-3   1   3

-3   -2   -1   0   1   2   3

Item i

Item information

0.25

0.20

0.15

0.10

0.05

0.00

-4   -2

http://130.208.71.121:3838/twopl_informati

2PL IRT information

Item Difficulty

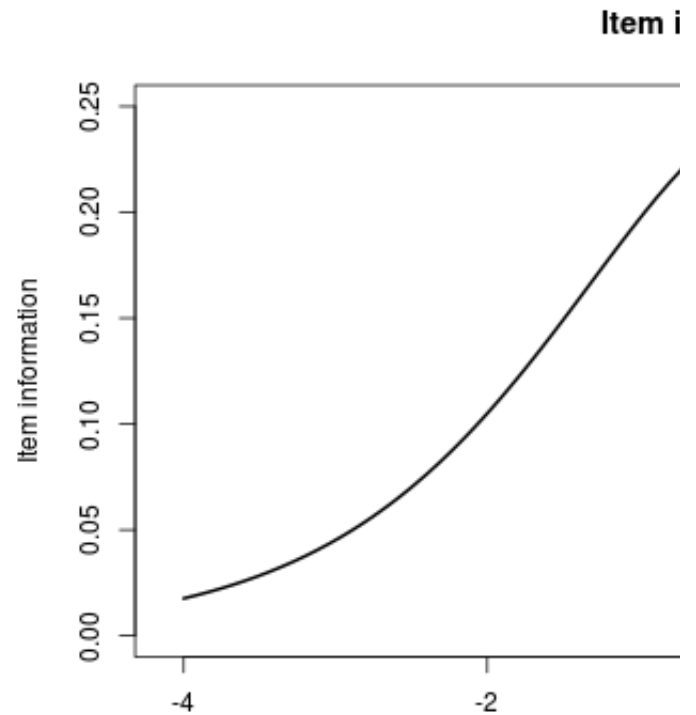0 ▼

Item Discrimination

1   3

1   1.2   1.4   1.6   1.8   2   2.2   2.4   2.6   2.8   3

http://130.208.71.121:3838/threepl_informa

3PL IRT model

Item Difficulty

0	▼

Item Discrimination

1   3
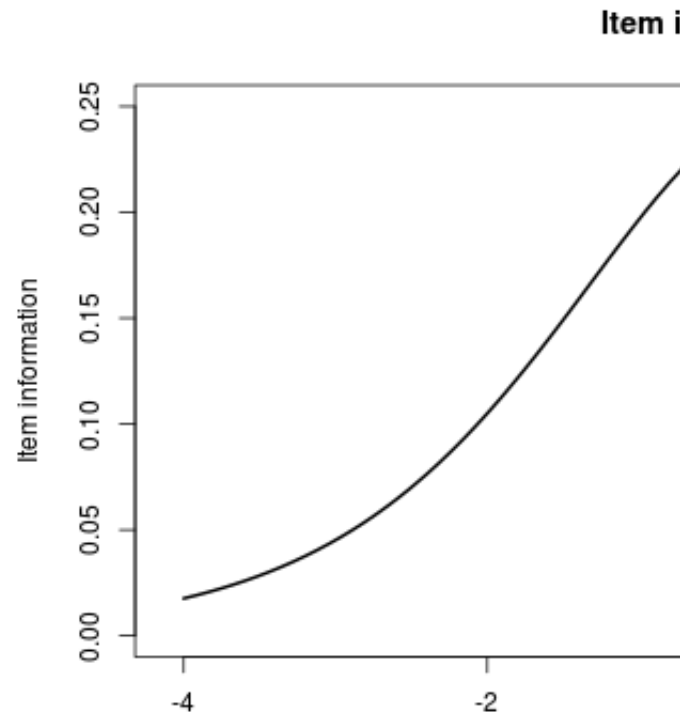
1   1.2   1.4   1.6   1.8   2   2.2   2.4   2.6   2.8   3

Guessing

0   1

0   0.25   0.5   0.75   1

TEST INFORMATION FUNCTION

Test information function