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IO3

Generic Tasks on University Level

Material-based Outputs

IO4

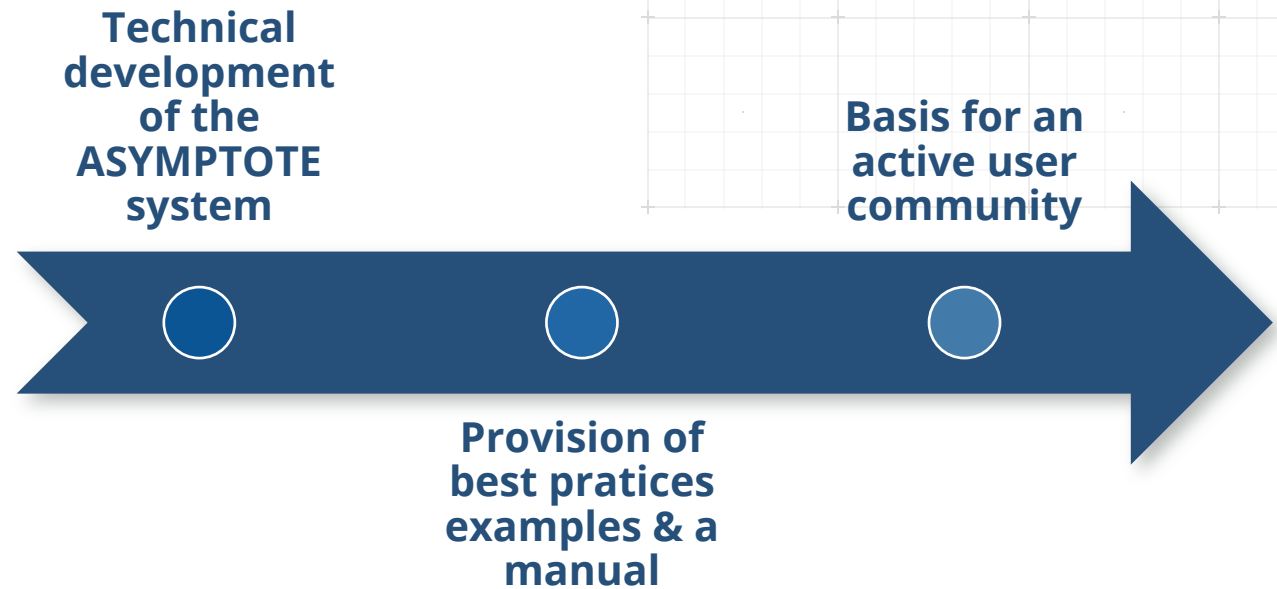# Generic Tasks on Secondary Level & Handbook

Material-based Outputs
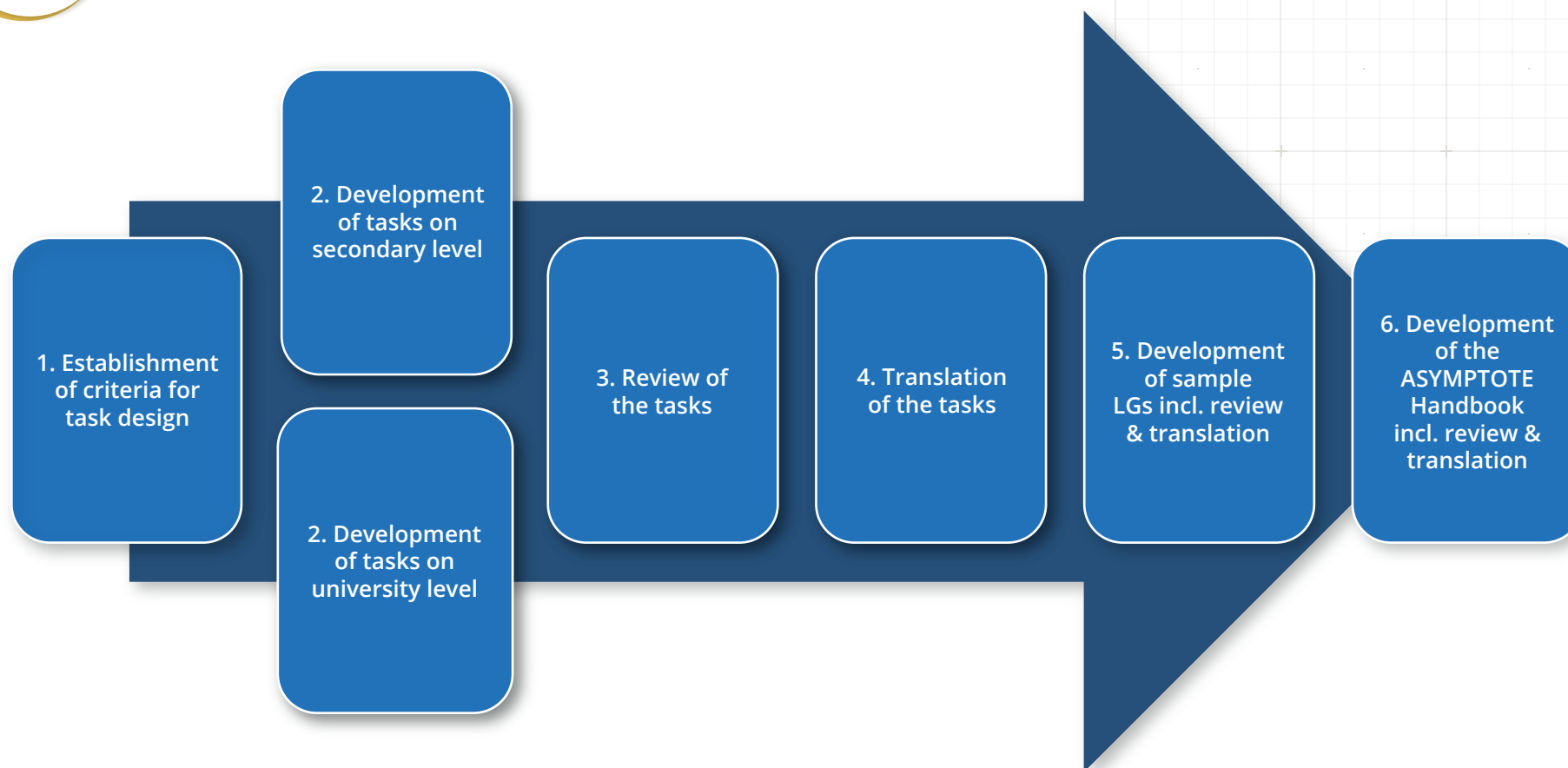
Purpose of Task Design

Within outputs IO3 & IO4, we give **best practice examples** on how to develop learning contents with the ASYMPTOTE system.

We aim to provide a profound number of tasks in the open database for exemplary topics. In doing so, we provide **ready-to-use materials** for teachers.

By the help of these tasks as well as self-learning materials (manual & video tutorials), we provide the basis for a rich and active **user community** creating tasks on multiple topics.

Technical development of the ASYMPTOTE system

Provision of best pratices examples & a manual

Basis for an active user community

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Phases of Task Design

1. Establishment of criteria for task design

2. Development of tasks on secondary level

2. Development of tasks on university level

3. Review of the tasks

4. Translation of the tasks

5. Development of sample LGs incl. review & translation

6. Development of the ASYMPTOTE Handbook incl. review & translation

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Erasmus+ Programme
of the European Union

1. Establishment of Criteria for Task Design

1. Level:

The tasks should be important for the topic. Thereby every tasks should be integrated in the level:
(1) basic, *(2) intermediate*, *(3) advanced*.

The levels are connected to the learning graph.

Basic was designed in the learning graph as a **support** task

Intermediate was designed in the learning graph as a **main** task

Advanced means in general additional **challenge** tasks.

CHALLENGE	MAIN	SUPPORT
⬤ ←	⬤ ↔	⬤
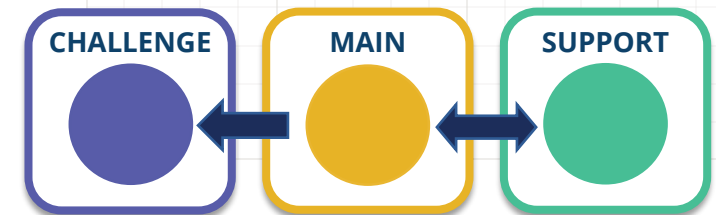
2. Types of tasks:

Studies have shown that complex tasks were underrepresented during the Covid-19-induced remote teaching phase. Thus, we do not only focus on (1) training and practicing tasks,
but also on (2) reasoning and (3) modeling tasks.

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1. Establishment of Criteria for Task Design

3. Hints: For every topic a minimum of two hints are necessary. For "reasoning tasks" the first hint should be a strategic hint (e.g., "use easy numbers like...").

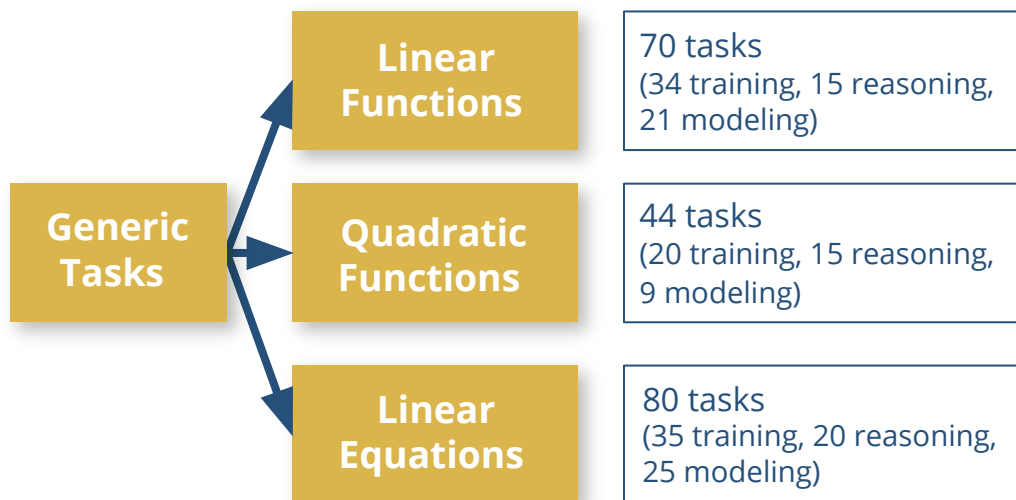**4. Answer format:** for every task, an appropriate answer format should be used.

5. Sample solution: For every task, a solution plan must be added. This solution must be detailed enough, that students can compare their own solution with the solution of the task.

6. Curriculum hierarchy: Tasks are assigned to a related curricular topic.

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2. Development of Tasks for Secondary Level

Creation of tasks in English language:

Examples in the field of linear functions:

Generic Tasks

Linear Functions → 70 tasks (34 training, 15 reasoning, 21 modeling)

Quadratic Functions → 44 tasks (20 training, 15 reasoning, 9 modeling)

Linear Equations → 80 tasks (35 training, 20 reasoning, 25 modeling)

Training	Reasoning	Modeling

2. Development of Tasks for University Level

Creation of tasks in English language:

Examples in the field of linear functions:

Generic Tasks

Matrices → 42 tasks (32 training, 4 reasoning, 6 modeling)

Inverse Trigonometric Functions → 192 tasks (164 training, 25 reasoning, 3 modeling)

Integrals → 110 tasks (106 training, 4 reasoning, 0 modeling)

Training	Reasoning	Modeling

3. Review of Tasks

1. Language check:

1. Language correctness (English) of the task
2. Comprehensibility and clarity of the task
3. Appropriateness of mathematical technical terms

2. Content-related check:

a. Mathematical correctness of the task
b. Appropriateness of the chosen answer format
c. Comprehensibility of the sample solution
d. Use of meaningful hints and provision of step-by-step guidance

Electric circui d system of linear equations

Compute the currents in the rical circuit shown in the figure.

Linear equations syste Engineering Education
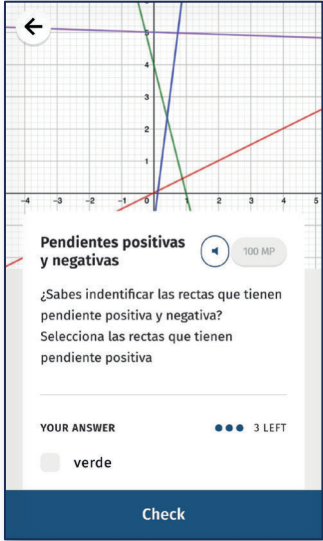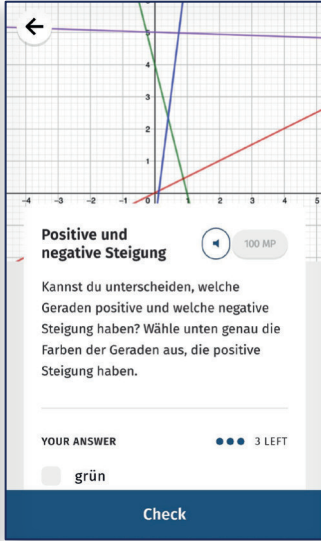
Created with GeoGebra

Positive and negative slopes
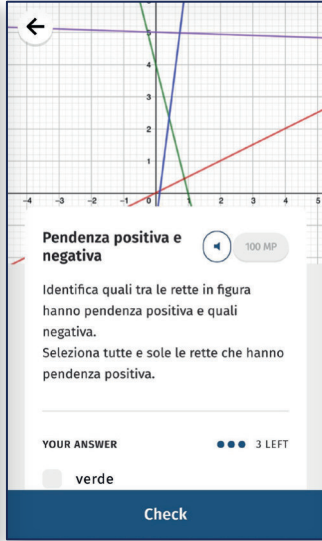
Can you identify which slopes are positive and which are negative?
Select all and only those graphs that have positive slopes.

slope   graph   linear functions

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4. Translation of Tasks

A wide range of tasks is available in the following languages: English, German, Greek, Italian, Portuguese and Spanish.

Example task in the field of linear functions:

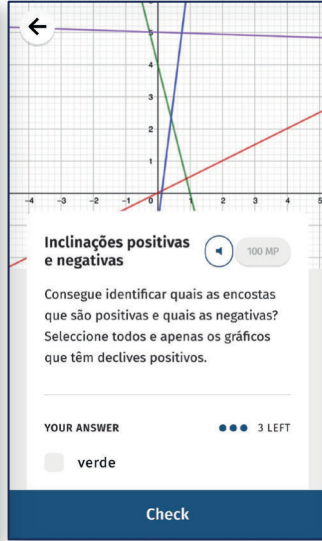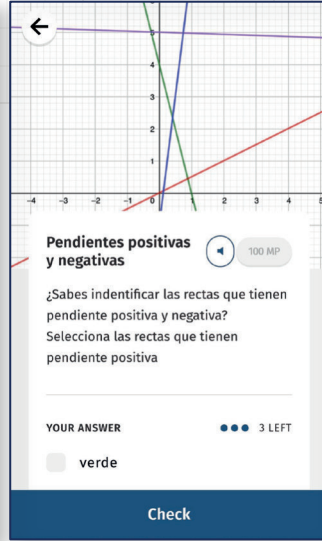| English	German	Greek	Italian	Portuguese	Spanish
Pendientes positivas y negativas ¿Sabes indentificar las rectas que tienen pendiente positiva y negativa? Selecciona las rectas que tienen pendiente positiva	**Positive und negative Steigung** Kannst du unterscheiden, welche Geraden positive und welche negative Steigung haben? Wähle unten genau die Farben der Geraden aus, die positive Steigung haben.	**Θετική και αρνητική κλίση** Μπορείτε να προσδιορίσετε ποιες κλίσεις είναι θετικές και ποιες αρνητικές; Επιλέξτε όλες και μόνο τις γραφικές παραστάσεις που έχουν θετικές κλίσεις.	**Pendenza positiva e negativa** Identifica quali tra le rette in figura hanno pendenza positiva e quali negativa. Seleziona tutte e sole le rette che hanno pendenza positiva.	**Inclinações positivas e negativas** Consegue identificar quais as encostas que são positivas e quais as negativas? Selecione todos e apenas os gráficos que têm declives positivos.	**Pendientes positivas y negativas** ¿Sabes indentificar las rectas que tienen pendiente positiva y negativa? Selecciona las rectas que tienen pendiente positiva
YOUR ANSWER verde	YOUR ANSWER grün	YOUR ANSWER πράσινη	YOUR ANSWER verde	YOUR ANSWER verde	YOUR ANSWER verde
Check	Check	Check	Check	Check	Check

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4. Translation of Tasks

A wide range of tasks is available in the following languages: English, German, Greek, Italian, Portuguese and Spanish.
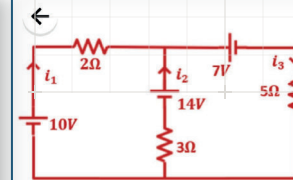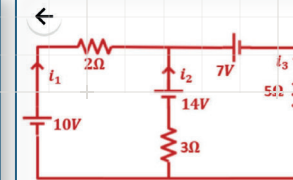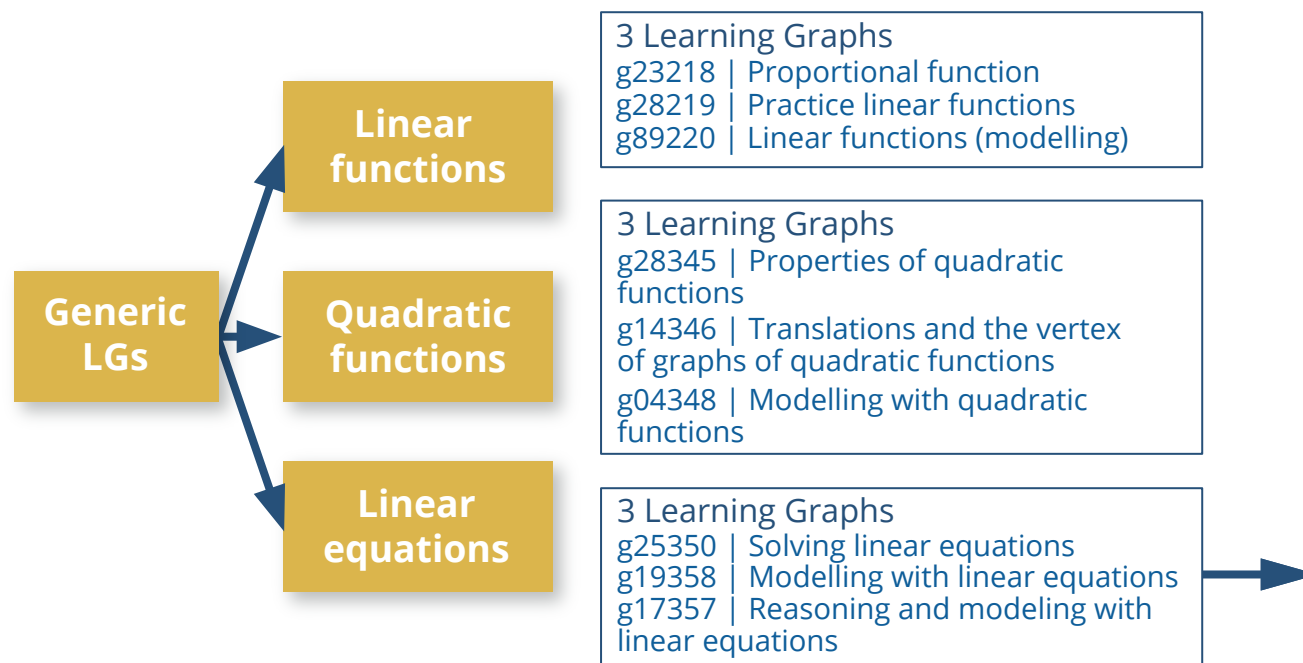
Example task in the field of matrices:

Electric circuits and system of linear equations

Compute the currents in the electrical circuit shown in the figure.

YOUR ANSWER ●●●● 4 LEFT

$i_1 =$ ___ A, $i_2 =$ ___ A and $i_3 =$ ___ A

Check

Elektrische Schaltkreise und lineare Gleichungssysteme

Berechne die Ströme im elektrischen Schaltkreis, der im Titelbild dargestellt ist.

YOUR ANSWER ●●●● 4 LEFT

$i_1 =$ ___ A, $i_2 =$ ___ A and $i_3 =$ ___ A

Check

Ηλεκτρικά κυκλώματα και σύστημα γραμμικών εξισώσεων

Υπολόγισε τις εντάσεις του ηλεκτρικού κυκλώματος που δείχνονται στη φωτογραφία.

YOUR ANSWER ●●●● 4 LEFT

$i_1 =$ ___ A, $i_2 =$ ___ A και $i_3 =$ ___ A

Check

Circuiti elettrici e sistemi di equazioni lineari

Calcola le correnti nel circuito elettrico mostrato in figura.

YOUR ANSWER ●●●● 4 LEFT

$i_1 =$ ___ A, $i_2 =$ ___ A and $i_3 =$ ___ A

Check

Circuitos elétricos e sistemas de equações lineares

Determine as correntes no circuito elétrico representado na figura.

YOUR ANSWER ●●●● 4 LEFT

$i_1 =$ ___ A, $i_2 =$ ___ A e $i_3 =$ ___ A

Check

Circuito eléctrico y sistema de ecuaciones lineales

Calcula las corrientes en el circuito eléctrico mostrado en la figura.

YOUR ANSWER ●●●● 4 LEFT

$i_1 =$ ___ A, $i_2 =$ ___ A y $i_3 =$ ___ A

Check

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5. Development of Sample LGs on Secondary Level
incl. review & translation

Generic LGs

Linear functions

3 Learning Graphs
g23218 | Proportional function
g28219 | Practice linear functions
g89220 | Linear functions (modelling)

Quadratic functions

3 Learning Graphs
g28345 | Properties of quadratic functions
g14346 | Translations and the vertex of graphs of quadratic functions
g04348 | Modelling with quadratic functions

Linear equations

3 Learning Graphs
g25350 | Solving linear equations
g19358 | Modelling with linear equations
g17357 | Reasoning and modeling with linear equations

Exemplary Learning Graph:
Modeling with linear equations

*The LGs can be accessed by entering the given code in the ASYMPTOTE app.
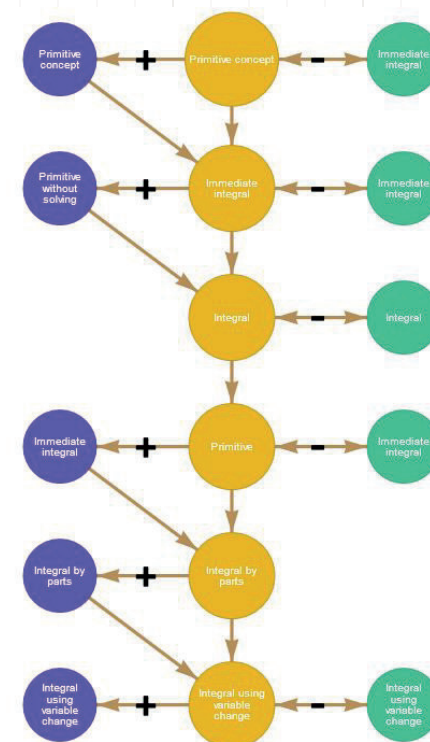
5. Development of Sample LGs on University Level
incl. review & translation

Generic LGs

Matrices

Inverse Trigonometric Functions

Integrals

3 Learning Graphs
g26196 | Matrix operations
g49195 | Elementary matrix operations, rank and inverse
g05197 | Matrix equations & systems of linear equations

5 Learning Graphs
g28248 | Inverse Trigonometric Function: arcsin
g03221 | Inverse Trigonometric Function: arccos
g18222 | Inverse Trigonometric Function: arctan
g78228 | Inverse Trigonometric Function: arccot
g67251 | Inverse Trigonometric Functions

2 Learning Graphs
g28401 | Definite integrals and application
g47328 | Indefinite integrals

*The LGs can be accessed by entering the given code in the ASYMPTOTE app.

Exemplary Learning Graph:
Inverse trigonometic functions: arccos
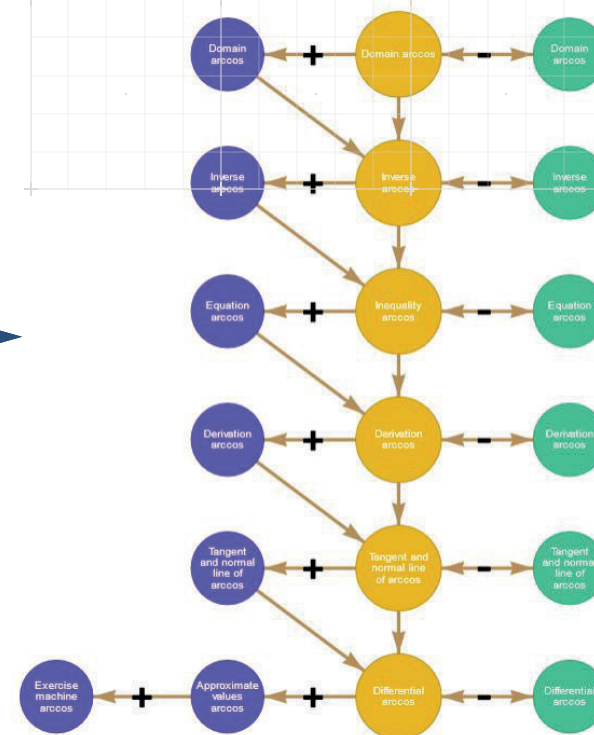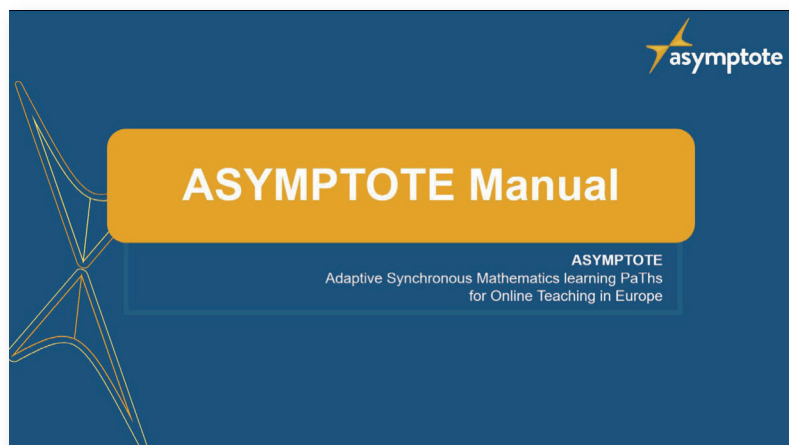
6. Development of the ASYMPTOTE Handbook
incl. review & translation

The purpose of the ASYMPTOTE Manual is to provide step-by-step guidance to educators on secondary school and university levels on how to use the ASYMPTOTE system.

It gives an overview of the ASYMPTOTE web portal and app as well as the Digital Classroom. It also provides best practice examples for task and LG design.

ASYMPTOTE Manual

ASYMPTOTE
Adaptive Synchronous Mathematics learning PaThs
for Online Teaching in Europe

1. Introduction
   1.1. The ASYMPTOTE idea
   1.2. Key functionalities of ASYMPTOTE
2. The ASYMPTOTE web portal
   2.1. How to create an account on the web portal
   2.2. How to create tasks
   2.3. Answer formats
   2.4. How to create a Learning Graph
   2.5. How to search for tasks/Learning Graphs and how to share them
3. The Digital Classroom
4. The ASYMPTOTE App

5. Best practice examples
   5.1. Linear Functions 1, 2, 3
   5.2. Quadratic Functions 1, 2, 3
   5.3. Linear Equations 1, 2, 3
   5.4. Integrals 1, 2
   5.5. Inverse Trigonometric Functions 1, 2, 3, 4, 5
   5.6. Matrices 1, 2, 3, 4
6. Video Tutorials and Theoretical Background
7. References

6. Development of the ASYMPTOTE Handbook
incl. review & translation

The manual is available in all partner languages.

It is available here:

Please select your desired language on the linked web page to access the manual in this one.

Exemplary section: how to chose in appropriate answer format for task creation: