

## Summary

### HL Functions

Subject	Year	Start date	Duration
Mathematics: analysis and approaches	IB1	Week 1, September	5 weeks

#### Course Part

#### Description

In this unit you will explore the manipulation and use of functions.

## Inquiry & Purpose

### ? Inquiry / Higher Order Questions

Type	Inquiry Questions
Skills-based	Why can a many to one function not have an inverse?
Skills-based	Why is a domain so important to functions in a context?

## Curriculum

### ⊕ Aims

Develop an understanding of the concepts, principles and nature of mathematics

### ◇ Objectives

**Knowledge and understanding: Recall, select and use their knowledge of mathematical facts, concepts and techniques in a variety of familiar and unfamiliar contexts.**

### 📖 Syllabus Content

#### Topic 2: Functions

##### SL Content

##### SL 2.1

Lines with gradients  $m_1$  and  $m_2$  Parallel lines  $m_1 = m_2$ . Perpendicular lines  $m_1 \times m_2 = -1$ .

##### SL 2.2

Concept of a function, domain, range and graph. Function notation, for example  $f(x)$ ,  $v(t)$ ,  $C(n)$

The concept of a function as a mathematical model.

Informal concept that an inverse function reverses or undoes the effect of a function.

Inverse function as a reflection in the line  $y = x$ , and the notation  $f^{-1}(x)$

SL 2.3

The graph of a function; its equation  $y = f(x)$ .

Creating a sketch from information given or a context, including transferring a graph from screen to paper.

Using technology to graph functions including their sums and differences.

SL 2.4

Determine key features of graphs.

Finding the point of intersection of two curves or lines using technology.

SL 2.5

Composite functions.

Identity function. Finding the inverse function  $f^{-1}(x)$

SL 2.6

The quadratic function  $f(x) = ax^2 + bx + c$  its graph,  $y$ -intercept  $(0, c)$ . Axis of symmetry.

The form  $f(x) = a(x - p)(x - q)$ ,  $x$ -intercepts  $(p, 0)$  and  $(q, 0)$ .

The form  $f(x) = a(x - h)^2 + k$ , vertex  $(h, k)$ .

SL 2.7

Solution of quadratic equations and inequalities. The quadratic formula.

The discriminant  $\Delta = b^2 - 4ac$  and the nature of the roots, that is, two distinct real roots, two equal real roots, no real roots.

SL 2.8

The reciprocal function  $f(x) = \frac{1}{x}$ ,  $x \neq 0$ : its graph and self-inverse nature.

SL 2.11

Transformations of graphs. Translations:  $y = f(x) + b$ ;  $y = f(x - a)$

Reflections (in both axes):  $y = -f(x)$ ;  $y = f(-x)$

Vertical stretch with scale factor  $p$ :  $y = pf(x)$

Horizontal stretch with scale factor  $\frac{1}{q}$ :  $y = f(qx)$

Composite transformations.

AHL Content

AHL 2.12

Polynomial functions, their graphs and equations; zeros, roots and factors.

The factor and remainder theorems.

Sum and product of the roots of polynomial equations.

AHL 2.14

Odd and even functions.

Finding the inverse function,  $f^{-1}(x)$ , including domain restriction.

Self-inverse functions.

AHL 2.15

Solutions of  $g(x) \geq f(x)$ , both graphically and analytically.

AHL 2.16

The graphs of the functions,  $y = |f(x)|$  and  $y = f(|x|)$ ,  $y = \frac{1}{f(x)}$ ,  $y = f(ax + b)$ ,  $y = [f(x)]^2$

Solution of modulus equations and inequalities.

 ATL Skills

 Approaches to Learning



**Thinking**

- In this unit, we will

ask students to formulate a reasoned argument to support their opinion or conclusion

give students time to think through their answers before asking them for a response

reward a new personal understanding, solution or approach to an issue

ask open questions

set students a task which required higher-order thinking skills (such as analysis or evaluation)

build on a specific prior task

help students to make their thinking more visible (for example, by using a strategy such as a thinking routine)

require students to take an unfamiliar viewpoint into account when formulating arguments

ask questions that required the use of knowledge from a different subject from the one you are teaching

include a reflection activity

make a link to TOK



## Developing IB Learners

### ☆ Learner Profile



Inquirers



Knowledgeable



Thinkers