



ADDITIONAL MATHEMATICS

Secondary Three
Express

SYLLABUS AIMS

The Additional Mathematics syllabus aims to enable students who have an aptitude and interest in mathematics to

- Acquire mathematical concepts and skills for higher studies in Mathematics.
- Develop thinking, reasoning and metacognitive skills through mathematical problem solving.
- Connect ideas of mathematics and sciences through application.
- Appreciate the **abstract nature** of Mathematics.

WHAT IS MEANT BY “APTITUDE AND INTEREST”?

- **Strong aptitude in Mathematics**

- You see connections between different mathematics topics.
- You appreciate these connections.
- You want to prove or explain a Mathematics concept.

- **Strong interest in Mathematics**

- When there is a challenging mathematical problem,
 - You keep working on it until it is solved.
 - You read up more about what you don't know.
- You like to know the theory.
- You like spending time understanding a difficult concept.

SYLLABUS CONTENT

In general, there are three strands

1) Algebra

An extension of Elementary Mathematics to

- Solve more complex equations
- Understand the reasons the mathematical applications

2) Geometry and Trigonometry

An extension of Elementary Mathematics to

- Include trigonometry beyond the right-angled triangle.
- Solving and proving questions involving trigonometry ratios.
- Proving theorems in geometry.

SYLLABUS CONTENT

3) Calculus

- **Not** learnt in Elementary Mathematics
- Calculus is a branch of mathematics that helps us understand changes between values that are related by a function.

For details, go to the Singapore Examinations and Assessment Board (SEAB) website to look at the syllabus.

ALGEBRA EXAMPLES:

Mathematics

Identities : We deal with power 2

$$(a \pm b)^2 = a^2 \pm 2ab + b^2$$

$$a^2 - b^2 = (a + b)(a - b)$$

Additional Mathematics

Binomial Expansion: We deal with higher powers

$$\left(2x + \frac{3}{x}\right)^8 = (2x)^8 + \binom{8}{1}(2x)^7 \left(\frac{3}{x}\right) + \binom{8}{2}(2x)^6 \left(\frac{3}{x}\right)^2 + \binom{8}{3}(2x)^5 \left(\frac{3}{x}\right)^3 + \dots + \left(\frac{3}{x}\right)^8$$

TRIGONOMETRY EXAMPLES:

Elementary Mathematics

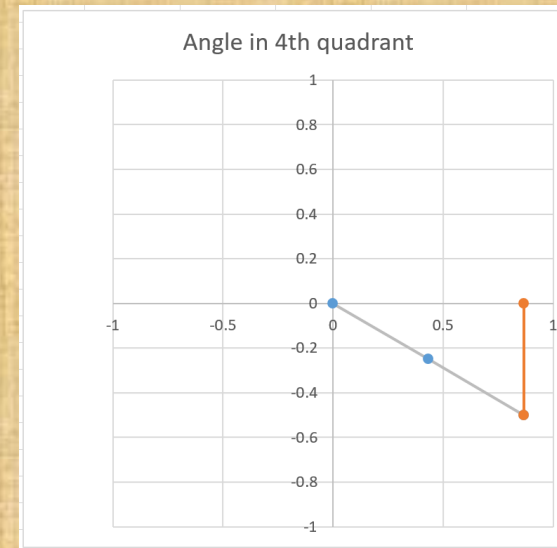
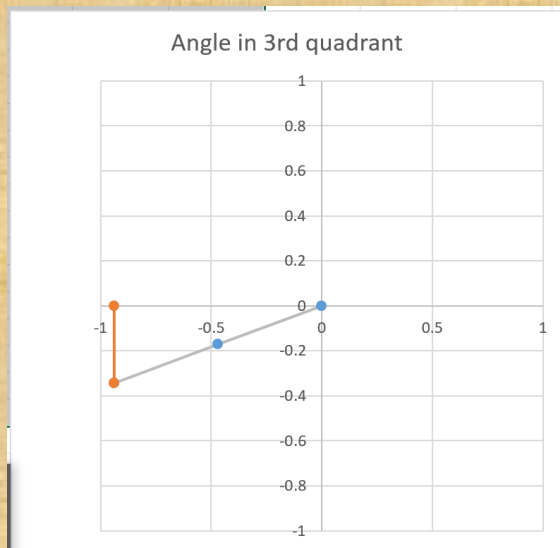
We deal with the Sine, Cosine and Tangent of angles that up to 180°

$$\sin x = \sin(180^\circ - x)$$

$$\cos x = -\cos(180^\circ - x)$$

Additional Mathematics

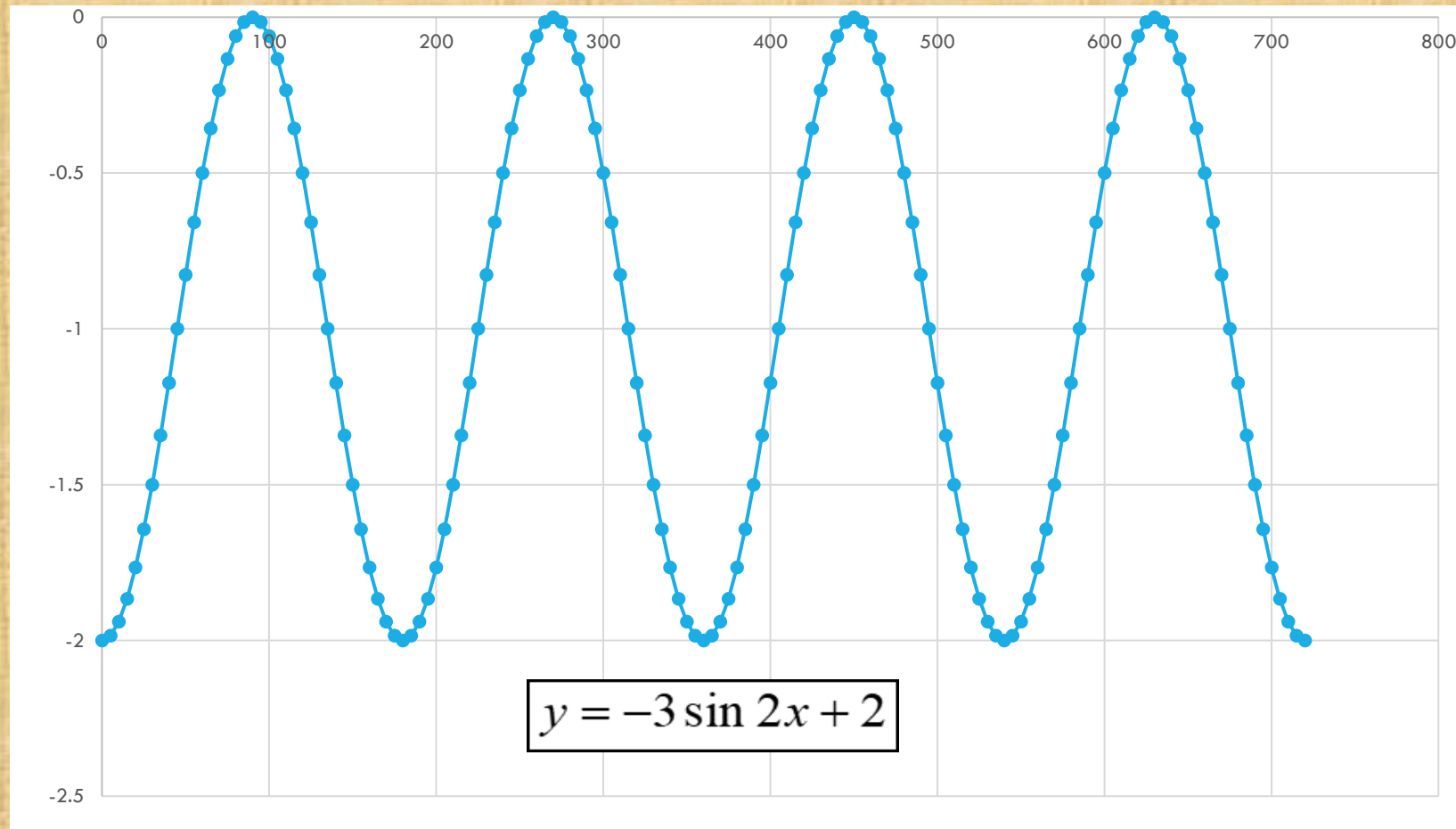
We deal with the Sine, Cosine and Tangent of angles up to 360° and beyond.



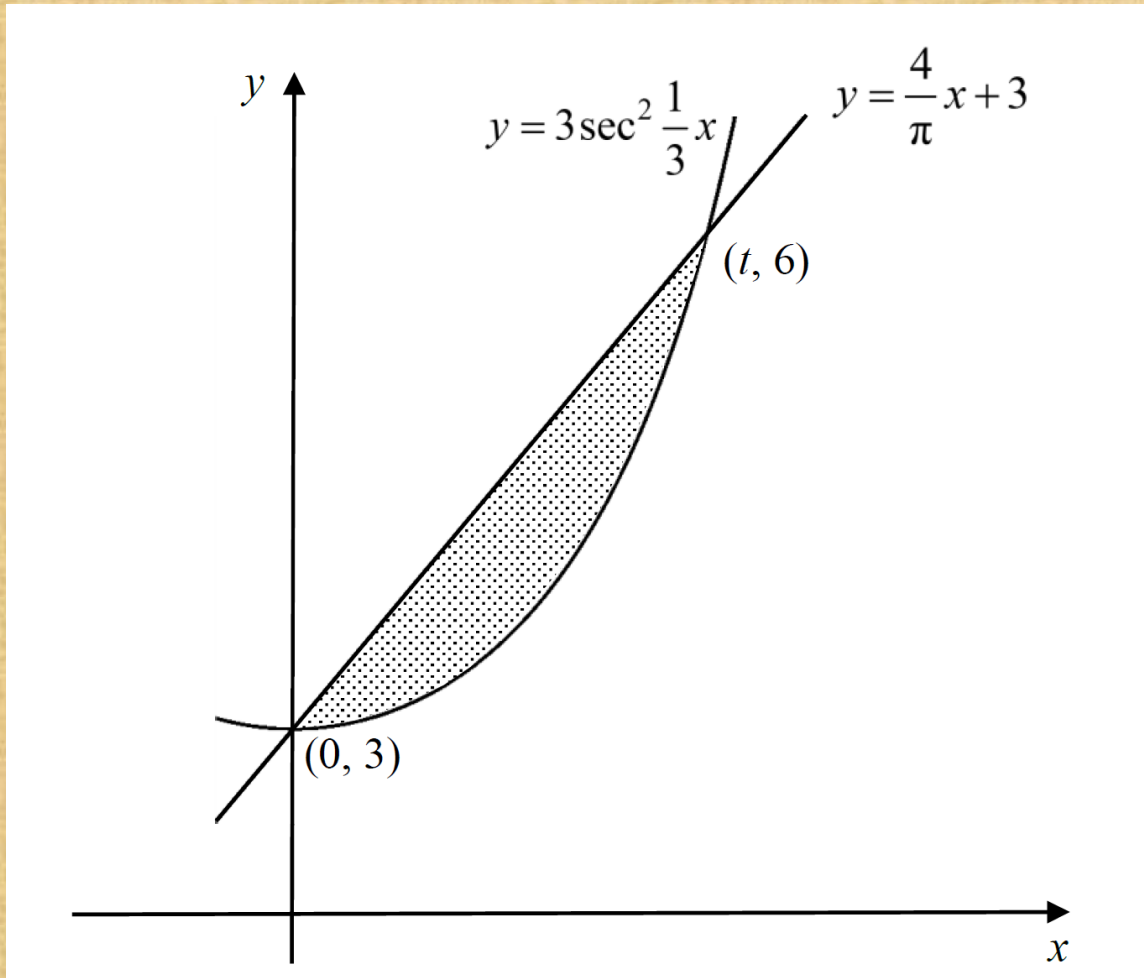
TRIGONOMETRY GRAPH EXAMPLES:

Additional Mathematics

We deal with the sine, cosine and tangent of angles up to 360° and beyond.



CALCULUS EXAMPLE:



Additional Mathematics

We do integration to calculate the area under a graph.

ANOTHER EXAMPLE:

Q (i) Differentiate $\cos 2x + \ln(\sin 2x)$ with respect to x . [3]

(ii) Hence integrate $3 \sin x - \frac{2}{\tan 2x}$ with respect to x . [4]

Part (i) solution

$$\text{Let } y = \cos 2x + \ln(\sin 2x)$$

$$\frac{dy}{dx} = -2\sin 2x + \frac{2\cos 2x}{\sin 2x}$$

M1 M1

$$= -2\sin 2x + \frac{2}{\tan 2x}$$

Part (ii) solution

$$-\frac{2}{\tan 2x} = -\frac{dy}{dx} - 2\sin 2x$$

$$\int 3\sin x - \frac{2}{\tan 2x} dx$$

$$= \int 3\sin x - \frac{dy}{dx} - 2\sin 2x dx$$

$$= \int 3\sin x - 2\sin 2x - \frac{dy}{dx} dx$$

$$= -3\cos x + \frac{2\cos 2x}{2} - (\cos 2x + \ln(\sin 2x)) + C$$

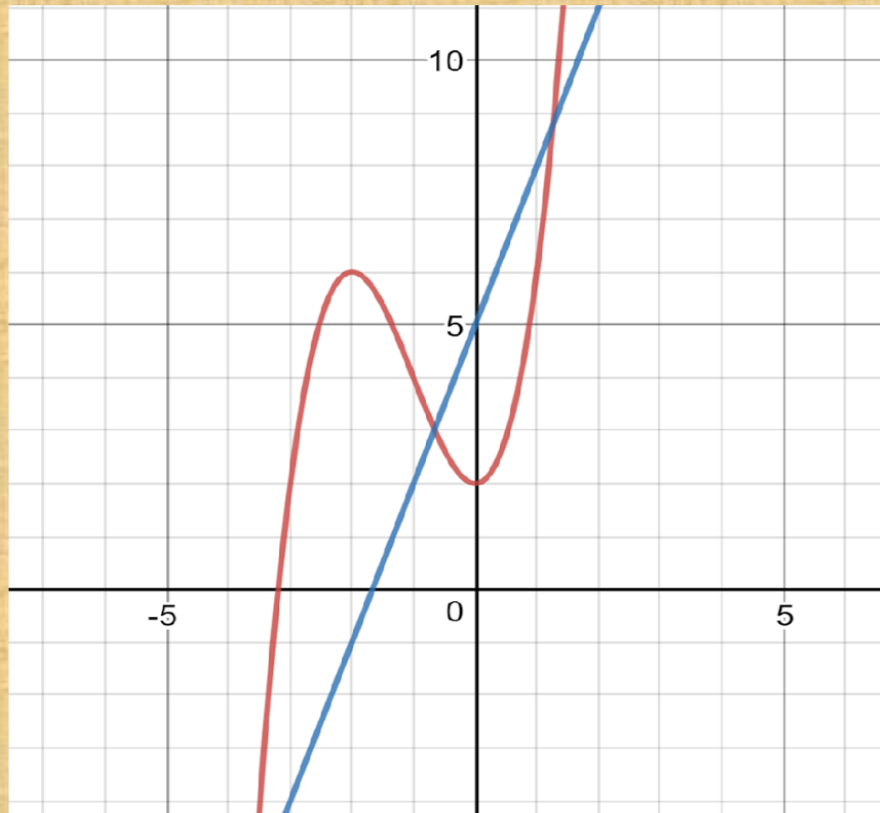
A1

$$= -3\cos x + \cos 2x - \cos 2x - \ln(\sin 2x) + C$$

$$= -3\cos x - \ln(\sin 2x) + C$$

ABSTRACT NATURE OF MATHEMATICS (EXAMPLE)

Elementary Mathematics



Additional Mathematics

Without drawing the curve
Understand why there are two turning points.

Find the coordinates of the turning points and the nature of these turning points.

Find the coordinates of the points of intersection using Algebra.

TO DO WELL IN ADDITIONAL MATHEMATICS

- You are encouraged to take Additional Mathematics if you have a strong interest in it and is willing to work hard at it.
- You should have a **firm foundation** in Lower Secondary Mathematics, especially Algebra.

FURTHER EDUCATION OPPORTUNITIES

Additional Mathematics is a relevant subject if you intend to

- Study H2 Mathematics in Junior College for GCE A Level.
- Pursue a Polytechnic course that requires strong foundation in Mathematics (e.g. Engineering).

Check out the Polytechnic course website to find out whether Additional Mathematics is a relevant subject.