THT.

THT WORKSHEETS

IB Diploma Programme

Mathematics: Analysis & Approaches

Higher Level (HL)

Learning Pack

Student Name: _____

Date: _____

Recommended Time: 60 minutes

Why This Learning Pack Matters

IB Mathematics: Analysis & Approaches HL challenges students to develop deep mathematical understanding alongside strong analytical reasoning. Students are expected to connect concepts, justify their methods and communicate mathematics with precision. This Learning Pack reflects that philosophy through a balance of algebra, functions, calculus and mathematical interpretation.

Instructions

- Answer all questions.
- Show clear mathematical working.
- Justify your reasoning where appropriate.
- Give exact answers unless instructed otherwise.

1.

Solve the equation.

$2x^2 - 7x + 3 = 0$

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Give your answers in exact form.

2.

The function

$f(x) = x^2 - 4x + 1$

a) Find $f(5)$.

b) Find the coordinates of the turning point.

3.

The function

$g(x) = 3x - 5$

Find:

a) $g^{-1}(x)$

b) Verify your answer by showing that

$g(g^{-1}(x)) = x$.

4.

Differentiate

$f(x) = 4x^3 - 9x^2 + 7$

5.

A particle moves along a straight line according to

$s(t) = 2t^3 - 9t^2 + 12t$

where s is measured in metres and t in seconds.

Find:

a) the velocity function

b) the velocity when $t = 2$.

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6.

The function

$f(x) = x^2$

is transformed to

$g(x) = (x - 2)^2 + 5$

Find:

a) the coordinates of the turning point of **g(x)**

b) the axis of symmetry

c) explain how the graph of **f(x)** has been transformed to obtain **g(x)**

7.

Expand and simplify.

$(2x - 1)^3$

8.

Solve the inequality.

$3x - 7 \leq 2x + 5$

Represent your answer on a number line.

9.

The population of a town is modelled by

$P(t) = 18{,}000(1.025)^t$

where t is measured in years.

a) Find the population after 8 years.

b) Explain one limitation of this model.

10.

The graph of

$y = x^2 - 6x + 5$

cuts the x-axis at two points.

Find the coordinates of both points.

11.

A sequence is defined by

5, 11, 17, 23, ...

a) Find the common difference.

b) Write a formula for the nth term.

c) Find the 25th term.

12.

The probability that a machine produces a faulty component is 0.04.

If 120 components are produced, how many faulty components would you expect?

Explain why the actual number may differ.

13.

A company models its monthly profit by

$P(x) = -2x^2 + 160x - 1800$

where x is the number of products sold (in hundreds).

a) Find the value of x that gives the maximum profit.

b) Determine the maximum profit.

14.

The line

$2x - y + 7 = 0$

Find:

a) its gradient

b) the equation of the line perpendicular to it passing through

(3, 4).

15.

A student states:

> "Every differentiable function is continuous."

Is the statement true?

Briefly justify your answer.

Reflection

Before reading the solutions...

The concept I found most challenging was:

One mathematical connection I noticed was:

One topic I would like to investigate further is:

End of Learning Pack

Please check your answers before reading the **Learn With the Solutions** booklet.