

Name	Date started	Target end date
------	--------------	-----------------

WJEC Level 2 Additional Mathematics – Question Pack

Deriving dy/dx from the limit definition – expanding $f(x+h)$, simplifying and letting h tend to 0.

REVISE
.wales

Differentiation from first principles

Calculus · Level 2 Certificate (9550) · calculator allowed

Deriving dy/dx from the limit definition – expanding $f(x+h)$, simplifying and letting h tend to 0.

LEVEL 2 · 9550

Estimated time for entire question pack: ~1 hours 17 minutes

At the Additional Maths pace of ~1.2 min/mark (64 marks across 12 questions).

*You are advised to **not** attempt to complete all of this in one sitting.*

ABOUT THIS QUESTION PACK

This is a **focused single-topic practice pack**, not a single mock paper. It gathers every question on this topic from the 2011–2024 papers.

Questions are ordered by year, newest first.

INSTRUCTIONS

Use black ink or black ball-point pen. Show all working – method marks are awarded for clear setup.

A calculator is allowed throughout this qualification.

All question content is © WJEC CBAC Ltd. and reproduced for revision purposes only.

Differentiation from first principles – what's examined

WJEC Level 2 Additional Mathematics (9550) · single written paper, calculator allowed.

The definition Calculus

- Form $[f(x+h) - f(x)] / h$.
- Expand and simplify the numerator.
- Let h tend to 0.

Algebra Algebra

- Expand $(x+h)^2$ etc. carefully.
- Cancel the $f(x)$ terms.
- Divide every term by h before the limit.

Showing it Method

- All steps must be shown for this question.
- Don't quote the power rule.
- Conclude with dy/dx .

Differentiation from first principles in one page

Quick-reference notes – revisit before each question. Don't use during the questions.

Definition

$$dy/dx = \lim_{h \rightarrow 0} [f(x+h) - f(x)] / h$$

Step 1

Expand $f(x+h)$ fully, e.g. $(x+h)^2 = x^2 + 2xh + h^2$.

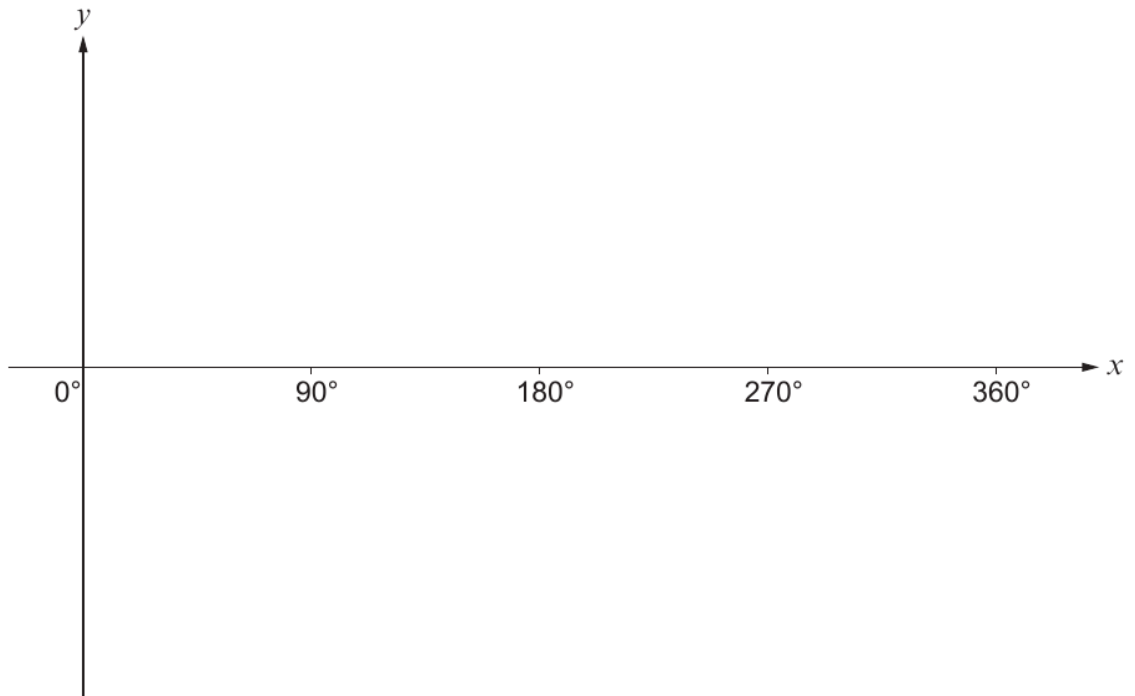
Step 2

Subtract $f(x)$, then factor out and cancel h .

Step 3

Let $h \rightarrow 0$; the remaining h -terms disappear.

15. (a) On the axes below, sketch the graph of $y = 3\sin 2x$ for values of x from 0° to 360° . [2]



(b) Find all the solutions of the equation $3\sin 2x = 0.777$ for values of x from 0° to 360° .
Give your solutions correct to 1 decimal place. [2]

.....

.....

.....

.....

.....

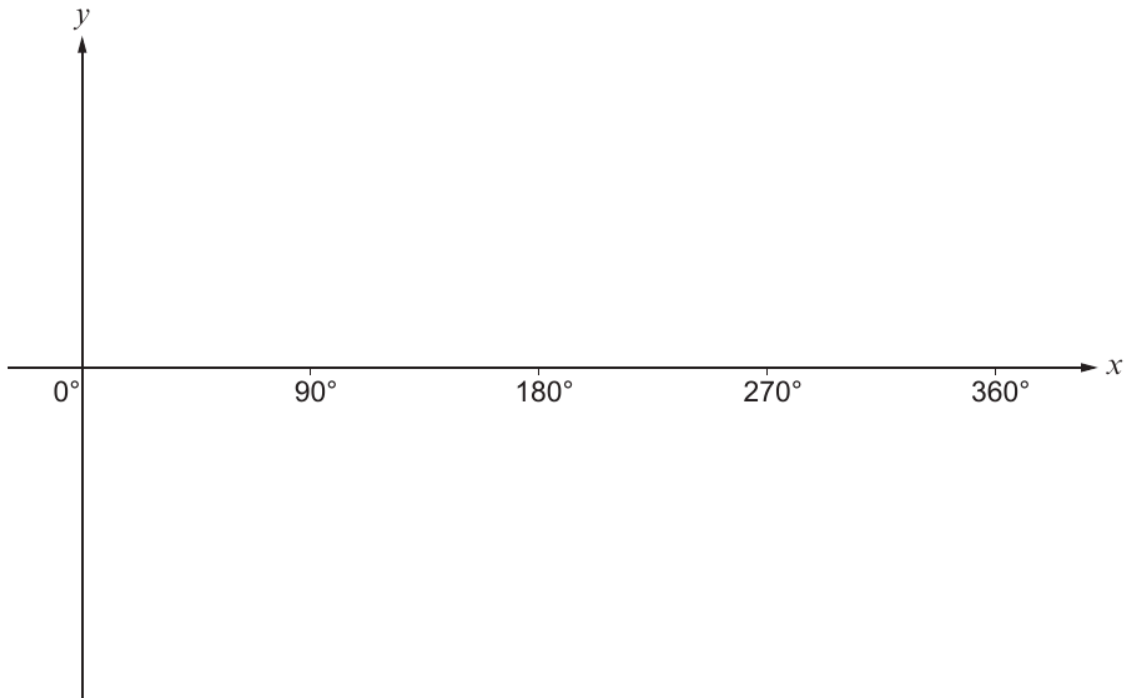
.....

.....

.....



15. (a) On the axes below, sketch the graph of $y = \sin 2x$ for values of x from 0° to 360° . [2]



- (b) Find all the solutions of the equation $\sin 2x = 0.47$ for values of x from 0° to 360° .
Give your solutions correct to the nearest degree. [2]

.....

.....

.....

.....

.....

.....

.....

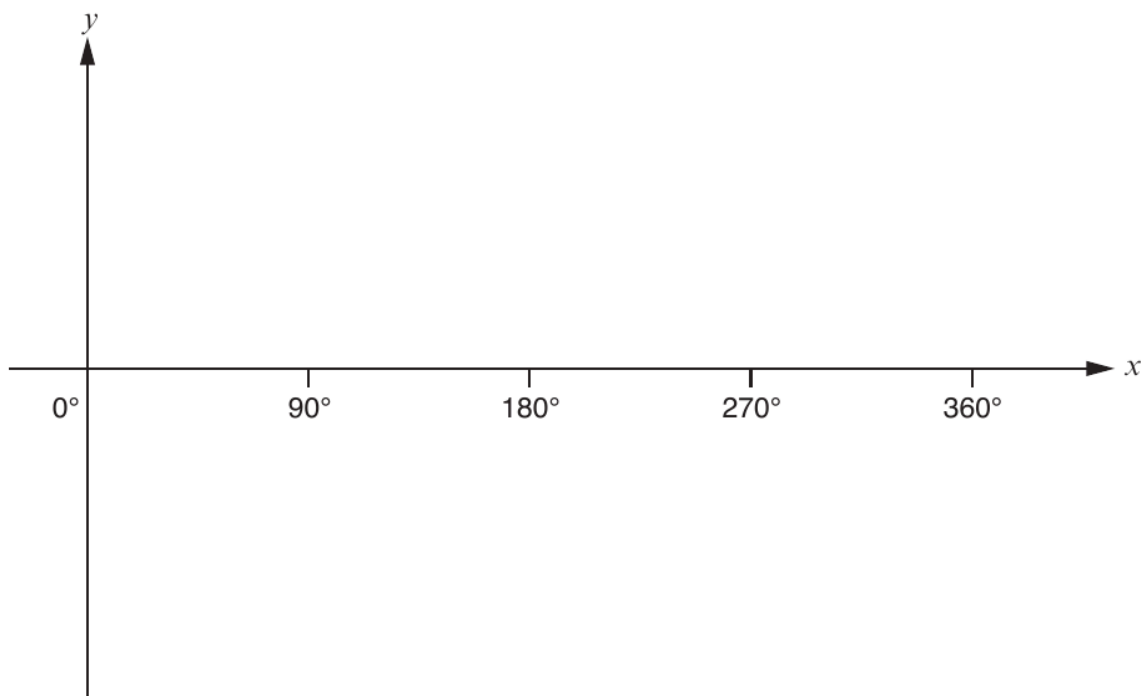
.....

.....

.....



15. (a) On the axes below, sketch the graph of $y = 6\cos x$ for values of x from 0° to 360° . [2]



- (b) Find all the solutions of the equation $6\cos x = -1$ for values of x from 0° to 360° . [2]

.....

.....

.....

.....

.....

.....

6. (a) Simplify $\frac{5}{3 + \sqrt{2}}$, leaving your answer in surd form.

Do not use a calculator to answer this question.
You must show all your working.

[3]

- (b) Showing all your working, simplify each of the following.

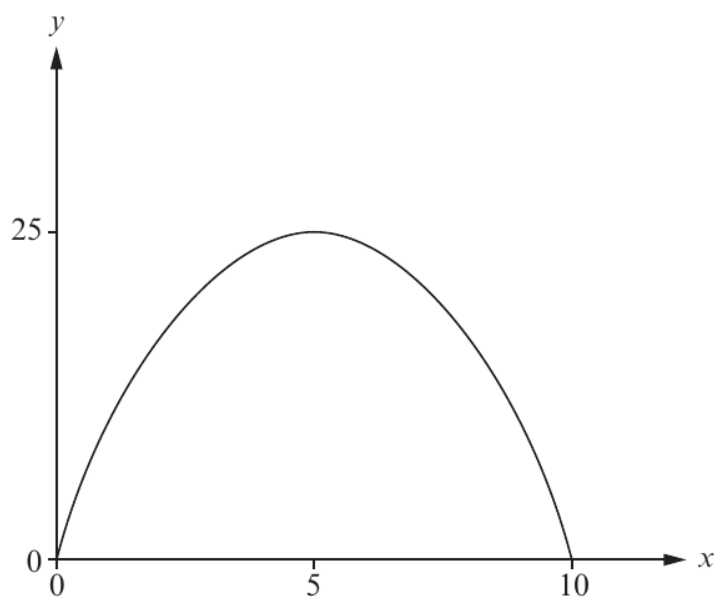
(i)
$$\frac{3x^{-\frac{7}{4}} \times 2x^{\frac{17}{4}}}{x^{\frac{3}{2}}}$$

[2]

(ii)
$$\frac{28x^{\frac{1}{7}} + 7x^{\frac{2}{7}}}{7x^{\frac{1}{7}}}$$

[2]

11. The diagram shows the curve $y = 10x - x^2$.



Showing all your working, calculate the area of the region bounded by the curve $y = 10x - x^2$ and the x -axis.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

[5]

16. (a) Select one of the following equations to match the sketch shown below.

$y = 2\sin 3x$

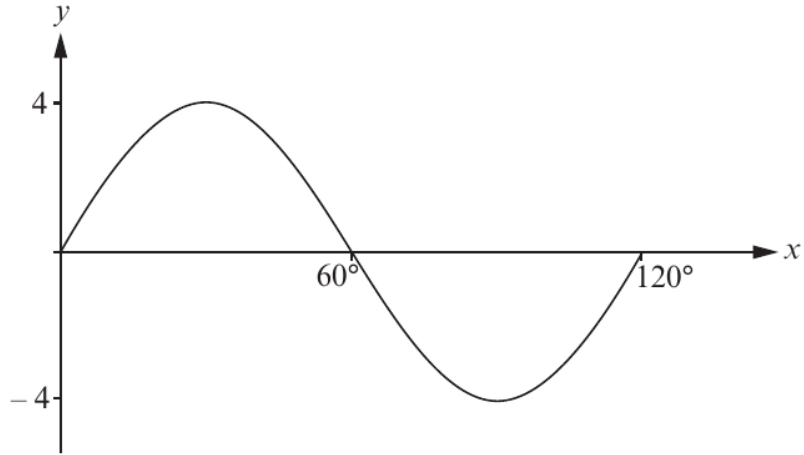
$y = 3\sin 3x$

$y = 4\sin 3x$

$y = 4\sin 4x$

$y = 3\sin 4x$

$y = 3\sin 2x$



.....

.....

.....

.....

.....

Equation

[1]

(b) (i) Write down the minimum value of $y = \sin 5x$.

.....

.....

[1]

(ii) Find all solutions of the equation $\sin 5x = 1$ for values of x from 0° to 100° .

.....

.....

.....

.....

.....

9. (a) Find $\frac{d^2y}{dx^2}$ when $y = 5x^8$.

.....

.....

.....

.....

.....

.....

.....

[2]

(b) Find $\int \left(4x^6 + \frac{1}{x^2} + 9 \right) dx$.

.....

.....

.....

.....

.....

.....

.....

[4]

(c) Evaluate $\int_1^2 (3x^2 + 1) dx$.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....