MATHEMATICS ADVANCED YEAR 11 - MODULE 3 - LESSON 7

The Second Derivative

Use this worksheet after reading the lesson to practise the key ideas and prove you can meet the success criteria.

Name _____

Date _____

Class _____

1. Key Ideas

The first derivative tells us how fast something is changing. The second derivative tells us how fast that change is changing. In physics, it is acceleration. In geometry, it reveals whether a curve is bending upwards like a smile, or downwards like a frown. Welcome to the second derivative.

- The notation for the second derivative: $f''(x)$ or $\frac{d^2y}{dx^2}$
- How concavity relates to the sign of the second derivative

2. Success Criteria

By the end, you should be able to:

- The notation for the second derivative: $f''(x)$ or $\frac{d^2y}{dx^2}$
- How to compute the second derivative by differentiating twice
- The geometric and physical interpretations of the second derivative

3. Key Terms

Derivative
The rate of change of a function at a point; the gradient of the tangent.

Differentiation
The process of finding the derivative of a function.

Stationary Point
A point where the derivative equals zero.

Chain Rule
A rule for differentiating composite functions: dy/dx = dy/du × du/dx.

Product Rule
A rule for differentiating products: d(uv)/dx = u(dv/dx) + v(du/dx).

Second Derivative
The derivative of the derivative; f''(x) or d^2y/dx^2; measures concavity.

4. Activity: Build the Lesson Map

Use the lesson to complete the table. Keep answers brief but specific.

Prompt	Your answer
Main concept	
Important example	
Common mistake to avoid	
How this links to the next lesson	

5. Short Answer Questions

1. Explain this lesson goal in your own words: "The notation for the second derivative: $f''(x)$ or $\frac{d^2y}{dx^2}$". Use one specific example from the lesson.

BAND 3 2 MARKS

2. Apply this idea to a new example: "How to compute the second derivative by differentiating twice". Show your reasoning clearly.

BAND 4 3 MARKS

3. Analyse why this idea matters for understanding The Second Derivative: "The geometric and physical interpretations of the second derivative".

BAND 5 4 MARKS

6. Extend: Apply the Idea

BAND 5/6 5 MARKS

A student gives a memorised answer about The Second Derivative but does not use evidence or reasoning.

Improve the answer by writing a stronger response that uses accurate terminology, a relevant example and a clear explanation.

7. Multiple Choice

1. What is the best first step when answering a question about The Second Derivative?

☐ A. Identify the key concept being tested

☐ B. Write every fact from memory

☐ C. Ignore the command word

☐ D. Skip examples and evidence

2. Which answer would show stronger understanding of The Second Derivative?

☐ A. An answer with accurate terms and reasoning

☐ B. A copied definition only

☐ C. A single-word response

☐ D. An answer with no example

3. What should you do if a question asks you to explain?

☐ A. Link the idea to a reason or cause

☐ B. List unrelated facts

☐ C. Only draw a diagram

☐ D. Write the shortest possible answer

8. Success Criteria Proof

Finish with evidence that you can do each success criterion.

SUCCESS CRITERION 1

Prove that you can: The notation for the second derivative: $f''(x)$ or $\frac{d^2y}{dx^2}$

BAND 3 2 MARKS

SUCCESS CRITERION 2

Prove that you can: How to compute the second derivative by differentiating twice

BAND 4 3 MARKS

SUCCESS CRITERION 3

Prove that you can: The geometric and physical interpretations of the second derivative

BAND 5 4 MARKS

One thing I still need help with: