MATHEMATICS ADVANCED YEAR 11 - MODULE 3 - LESSON 8

Stationary Points and Turning Points

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

Where does a roller coaster reach its highest peak? Where does a thrown ball pause at the top of its arc? These moments share a mathematical signature: the gradient is momentarily zero. In this lesson, you will learn how to find these special points — called stationary points — and how to determine whether they are summits, valleys, or flat terraces.

- Stationary points occur where $f'(x) = 0$
- Why the sign of $f''(x)$ determines concavity and nature of stationary points

2. Success Criteria

By the end, you should be able to:

- Stationary points occur where $f'(x) = 0$
- The second derivative test for classifying stationary points
- The difference between a turning point and a horizontal point of inflection

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).

Stationary Point
A point where f'(x) = 0; may be a maximum, minimum, or point of inflection.

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: "Stationary points occur where $f'(x) = 0$". Use one specific example from the lesson.

BAND 3 2 MARKS

2. Apply this idea to a new example: "The second derivative test for classifying stationary points". Show your reasoning clearly.

BAND 4 3 MARKS

3. Analyse why this idea matters for understanding Stationary Points and Turning Points: "The difference between a turning point and a horizontal point of inflection".

BAND 5 4 MARKS

6. Extend: Apply the Idea

BAND 5/6 5 MARKS

A student gives a memorised answer about Stationary Points and Turning Points 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 Stationary Points and Turning Points?

☐ 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 Stationary Points and Turning Points?

☐ 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: Stationary points occur where $f'(x) = 0$

BAND 3 2 MARKS

SUCCESS CRITERION 2

Prove that you can: The second derivative test for classifying stationary points

BAND 4 3 MARKS

SUCCESS CRITERION 3

Prove that you can: The difference between a turning point and a horizontal point of inflection

BAND 5 4 MARKS

One thing I still need help with: