MATHEMATICS ADVANCED YEAR 11 - MODULE 3 - LESSON 11

Increasing, Decreasing, and Stationary 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

A retailer notices that as they raise prices, profit first rises, then peaks, then falls. Calculus tells us exactly where that peak occurs — and where the business is growing versus shrinking. In this lesson, you will learn how the sign of the derivative reveals when a function is increasing or decreasing, and how to locate and classify the critical turning points.

- Increasing means $f'(x) > 0$; decreasing means $f'(x) < 0$
- Why the sign of $f'(x)$ determines the direction of the function

2. Success Criteria

By the end, you should be able to:

- Increasing means $f'(x) > 0$; decreasing means $f'(x) < 0$
- Stationary points occur where $f'(x) = 0$
- First derivative test classifications

3. Key Terms

and where the business
growing versus shrinking

function
increasing or decreasing, and how to locate and classify the critical turning points

monthly profit
modelled by $P(x) = -x^2 + 10x$, where x is the advertising spend in thousands of dollars

you think profit
increasing? For what values is it decreasing? Where do you think the maximum profit occurs?

Increasing
$f'(x) > 0$; decreasing means $f'(x)

product
the product of the derivatives

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: "Increasing means $f'(x) > 0$; decreasing means $f'(x) < 0$". Use one specific example from the lesson.

BAND 3 2 MARKS

2. Apply this idea to a new example: "Stationary points occur where $f'(x) = 0$". Show your reasoning clearly.

BAND 4 3 MARKS

3. Analyse why this idea matters for understanding Increasing, Decreasing, and Stationary Points: "First derivative test classifications".

BAND 5 4 MARKS

6. Extend: Apply the Idea

BAND 5/6 5 MARKS

A student gives a memorised answer about Increasing, Decreasing, and Stationary 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 Increasing, Decreasing, and Stationary 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 Increasing, Decreasing, and Stationary 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: Increasing means $f'(x) > 0$; decreasing means $f'(x) < 0$

BAND 3 2 MARKS

SUCCESS CRITERION 2

Prove that you can: Stationary points occur where $f'(x) = 0$

BAND 4 3 MARKS

SUCCESS CRITERION 3

Prove that you can: First derivative test classifications

BAND 5 4 MARKS

One thing I still need help with: