

Reading Time: An initial 2 minutes to view BOTH sections



MATHEMATICS METHODS : UNITS 3 & 4, 2023

JO

Test 1 – Differentiation Rules and Applications (10%) 3.1.7, 3.1.8, 3.1.10 – 3.1.16, 3.2.1 – 3.2.3

Time Allowed 18 minutes	First Name	Surname	Marks 15 marks
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Circle your Teacher's Name: Mrs Alvaro Ms Chua Mrs Fraser-Jones
 Mrs Greenaway Mr Luzuk Mrs Murray
 Ms Narendranathan Mr Tanday

Assessment Conditions: *(N.B. Sufficient working out must be shown to gain full marks)*

- ❖ Calculators: Allowed
- ❖ Formula Sheet: Provided
- ❖ Notes: Not Allowed

PART B – CALCULATOR ASSUMED

QUESTION 8

(4 marks)

The gradient of the curve with equation $y = \frac{a}{x} + bx^2$ at the point with coordinates (3,6) is 7.

Calculate the values of a and b .

QUESTION 9**(3, 1, 1, 4, 2 – 11 marks)**

A man walks along a riverbank in a downstream direction from point A to point B , a distance of x m, at a speed of 1.25 m/s. He then swims, at a speed of 1 m/s, to a point D which is directly opposite point C .

The point C is 20 m downstream from A . $DC = 10$ m. $0 \leq x \leq 20$

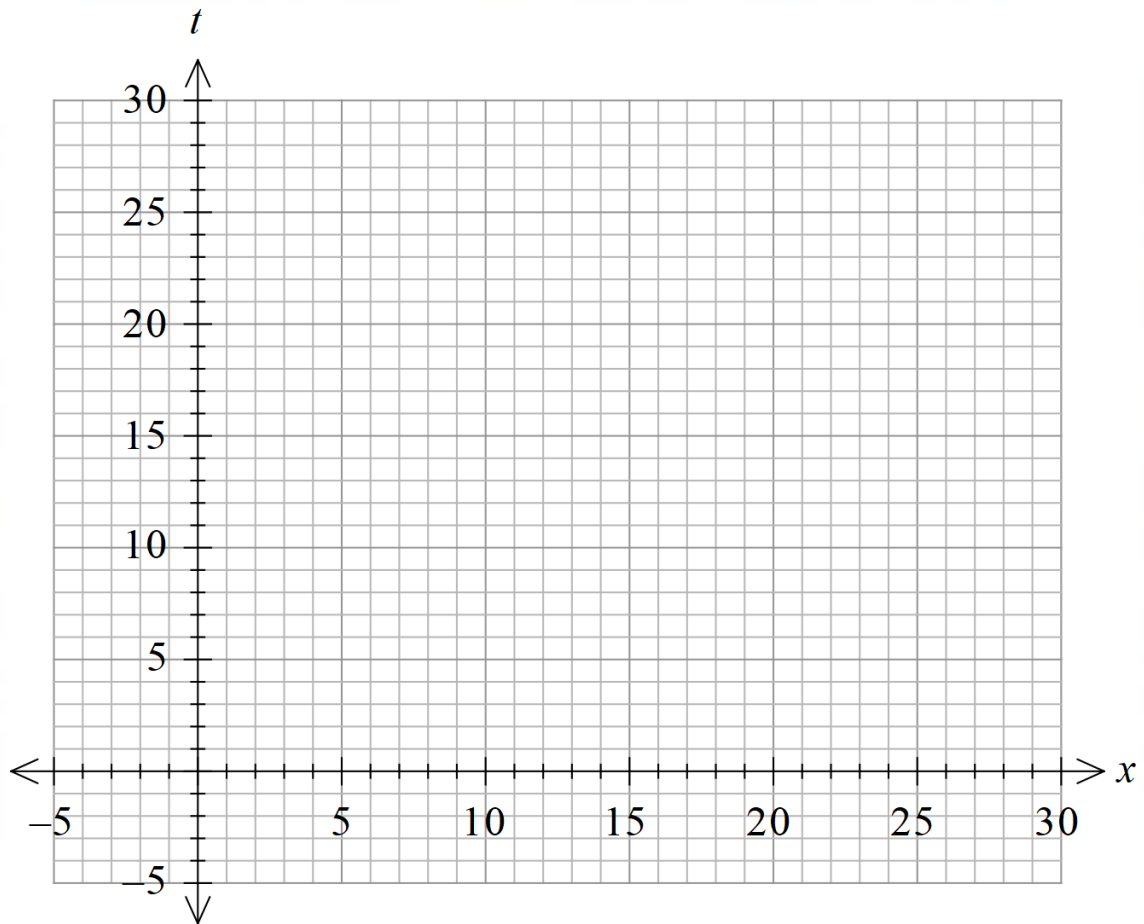
a) Show that the time taken (t seconds) to go from A to D in this way is:

$$t(x) = \sqrt{100 + (20 - x)^2} + \frac{4x}{5}$$

b) Find $\frac{dt}{dx}$.

c) Solve the equation $\frac{dt}{dx} = 0$ for $0 \leq x \leq 20$

d) Graph $t(x)$ for $0 \leq x \leq 20$ on the axes below, labelling key features:



e) Hence, find the minimum time to complete the journey and state where the man should leave the riverbank to start swimming.