Reading Time: An initial **2 minutes** to view **BOTH** sections

MATHEMATICS METHODS : UNITS 3 & 4, 2021

Test 1 – (10%)

3.1.1 to 3.1.16

Time Allowed	**First Name**	**Surname**	**Marks**
30 minutes			27 marks

Circle your Teacher's Name:

Mrs Alvaro	Mrs Bestall	Ms Chua
Mr Gibbon	Mrs Greenaway	Mr Luzuk
Mrs Murray	Ms Robinson	Mr Tanday

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

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

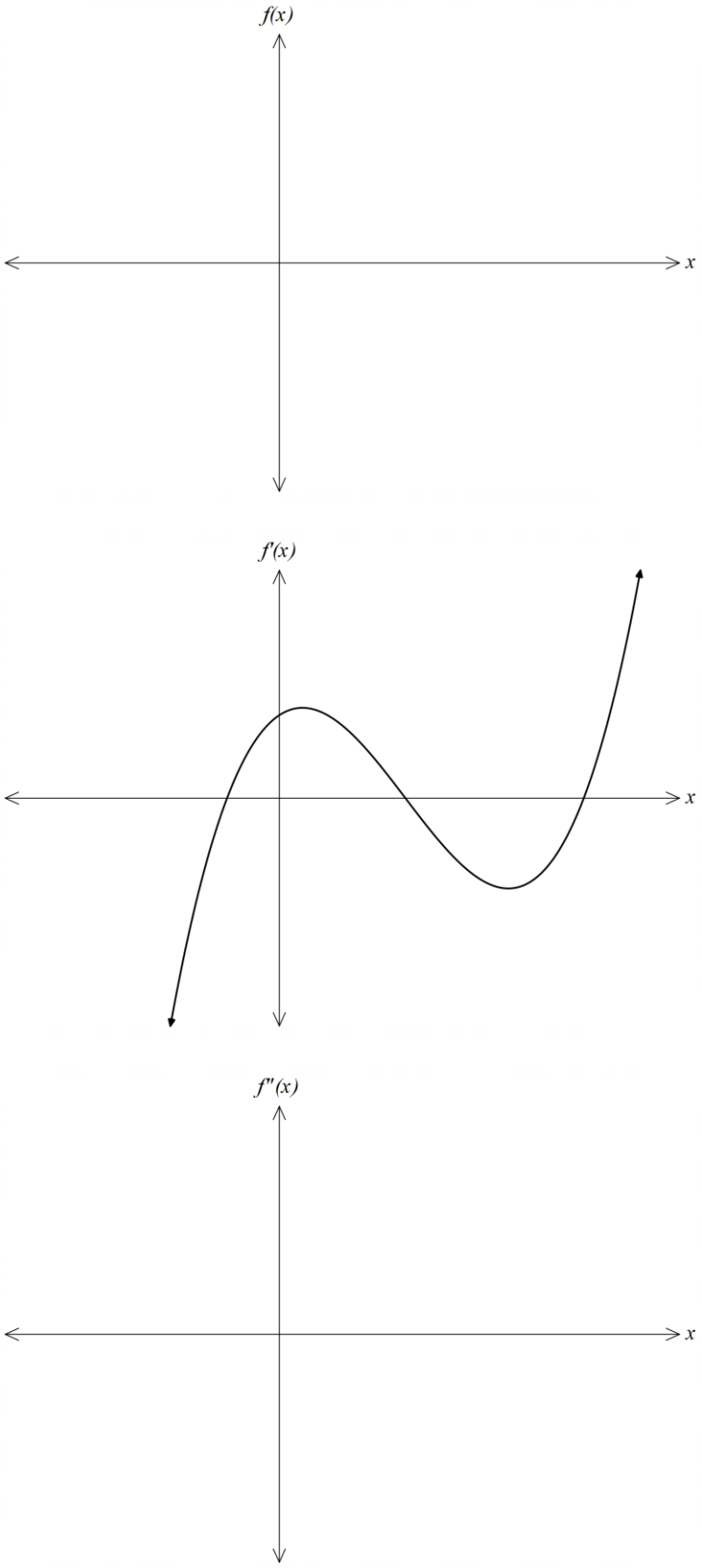
PART B – CALCULATOR ASSUMED

QUESTION 4 **[3 marks]**

Given that the value v (\$) of a particular mineral is tied to its mass M (g) and is satisfied by the equation $v = 510M^{\frac{3}{4}}$, find by using the incremental formula the approximate value of an 8.01gram sample.

QUESTION 5 **[5 marks]**

The middle graph below represents the gradient function of $f(x)$, sketch on the top axes a possible $f(x)$, and on the bottom axes a possible $f''(x)$.



QUESTION 6 **[6 marks]**

A body moves in a straight line so that its displacement, *s(t)* metres, from a point of origin after *t* seconds is given by $s(t) = t^3 - 9t^2 + 24t$, for $0 \leq t \leq 5$.

a) When is the body stationary? **[2 marks]**

b) When is the body moving fastest? **[2 marks]**

c) Calculate the distance travelled by the body in the first 4 seconds. **[2 marks]**

QUESTION 7 **[5 marks]**

Prove that the derivative of $y = \left(\frac{x^2-2}{x^2+1}\right)^4$ is given by $\frac{dy}{dx} = \frac{24x(x^2-2)^3}{(x^2+1)^5}$

QUESTION 8 **[3 marks]**

A pedantic child insists that the radii of all their spherical birthday balloons must be increased by 1%. Find the approximate percentage increase in volume of one such balloon.

QUESTION 9 **[5 marks]**

I want to construct a rectangular prism packing case from cardboard, with a lid, that will fully enclose an object whose length is three times its width *x*.
As the volume Vm^2 of the box is fixed, show that the area of cardboard required to make the case is a minimum when $x = \sqrt[3]{\frac{2V}{9}}$