



Course Methods Year 12 test one 2022

Student name: _____
Teacher name: _____

Task type: Response

Time allowed for this task: 40 mins

Number of questions: 8

Materials required: No calculators nor classpads allowed

Standard items: Pens (blue/black preferred), pencils (including coloured), sharpener, correction fluid/tape, eraser, ruler, highlighters

Special items: Drawing instruments, templates, NO notes.

Marks available: 40 marks

Task weighting: 10%

Formula sheet provided: Yes

Note: All part questions worth more than 2 marks require working to obtain full marks.

Q1 (3, 4 & 3 = 10 marks)

Differentiate the following:

a) $(3x - 1)^5$

b) $(5x^2 - 1)^7 3x^2$ and **simplify**

c) $\frac{3x+1}{\sqrt{7-2x}}$ do **not** simplify

Q2 (4 marks)

Determine the equation of the tangent to $y = (5x - 1)(2x^3)$ at (1,8)

Mathematics Department

Perth Modern

Q7 (4 marks)

Let A equal the number of hectares that a farmer will use to grow corn one season. The amount of corn to be harvested per hectare is given by $(800 - 20A)$ kg for $A \leq 40$. **Using calculus** determine the number of hectares that should be used to maximise the amount of corn produced.

Q8 (5 marks)

Let the cost, \$ C , to make x items in a factory be given by $C = 3x^3 - 12x^2 + 40x$ dollars. Using calculus show that the minimum **average cost** per item is equal to the marginal cost at this number of items.

Mathematics Department

Perth Modern

Q3 (5 marks)

Determine the coordinates of the stationary points and their nature for $y = x^3 + 2x^2 + x + 2$. Justify.

Q4 (3 marks)

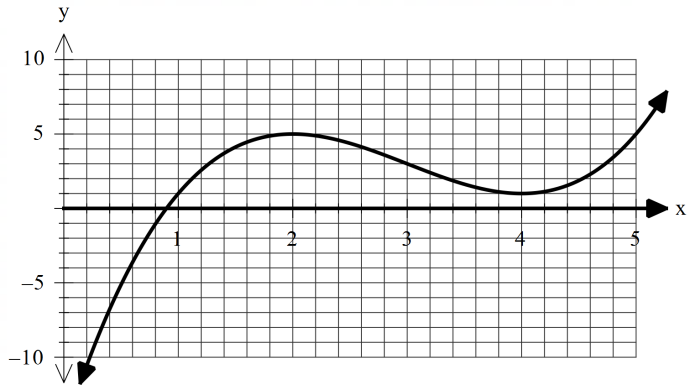
The displacement of a body from an origin O, at time t seconds, is x metres where

$$x = t^3 - 3t^2 + 5t + 1, \quad t \geq 0$$

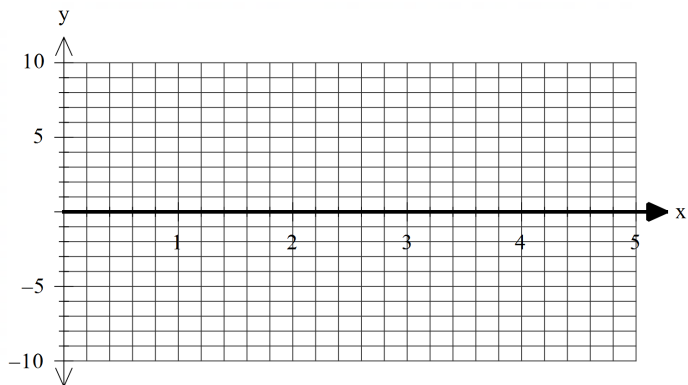
Determine the velocity and the displacement of the body when the acceleration is zero.

Q5 (4 marks)

Consider the function $f(x)$ which is graphed below.



On the **axes below**, sketch the gradient function $f'(x)$ indicating on your sketch the location of any stationary points and any inflection points for $f(x)$. (labelled)



Q6 (2 & 3 = 5 marks)

Consider the function $y = g(x)$ where $g(2) = 10$, $g'(2) = 5$.

a) Using the increments formula (small change) determine an approximate value for $g(2.1)$.

b) The volume of a sphere of radius r metres is given by $V = \frac{4}{3}\pi r^3$. Using the increments formula determine the approximate percentage change in volume for a 3% change in the radius.