MATHEMATICS LEARNING AREA

YEAR 12 MATHEMATICS METHODS UNIT 3

Assessment type: Response

TASK 3 - TEST 2

CALCULATOR - ASSUMED

:

Student Name:

TIME ALLOWED FOR THIS PAPER

Suggested:
Reading and Working time for Cal Assumed paper: 30 minutes in class under test conditions

MATERIAL REQUIRED / RECOMMENDED FOR THIS PAPER

TO BE PROVIDED BY THE SUPERVISOR
Question/answer booklet

TO BE PROVIDED BY THE CANDIDATE
Standard Items: pens, pencils, pencil sharpener, highlighter, eraser, ruler, drawing templates, Calculator

IMPORTANT NOTE TO CANDIDATES

No other items may be taken into the examination room. It is **your** responsibility to ensure that you do not have any unauthorised notes or other items of a non-personal nature in the examination room. If you have any unauthorised material with you, hand it to the supervisor **before** reading any further.

Structure of this paper

Section	Number of questions available	Number of questions to be attempted	Suggested working time (minutes)	Marks available
Calculator Assumed	4	4	30	**33**
			Marks available:	**/33**
			Task Weighting	7% for the pair of units

Instructions to candidates

Question 1 **(10 marks)**

A particle's velocity at t seconds, is $v(t) = 8\cos 2t$, and is travelling for 4π seconds.

a) Find the distance travelled by the particle for 4π seconds. (1 mark)

If the particle goes through the origin intially O.

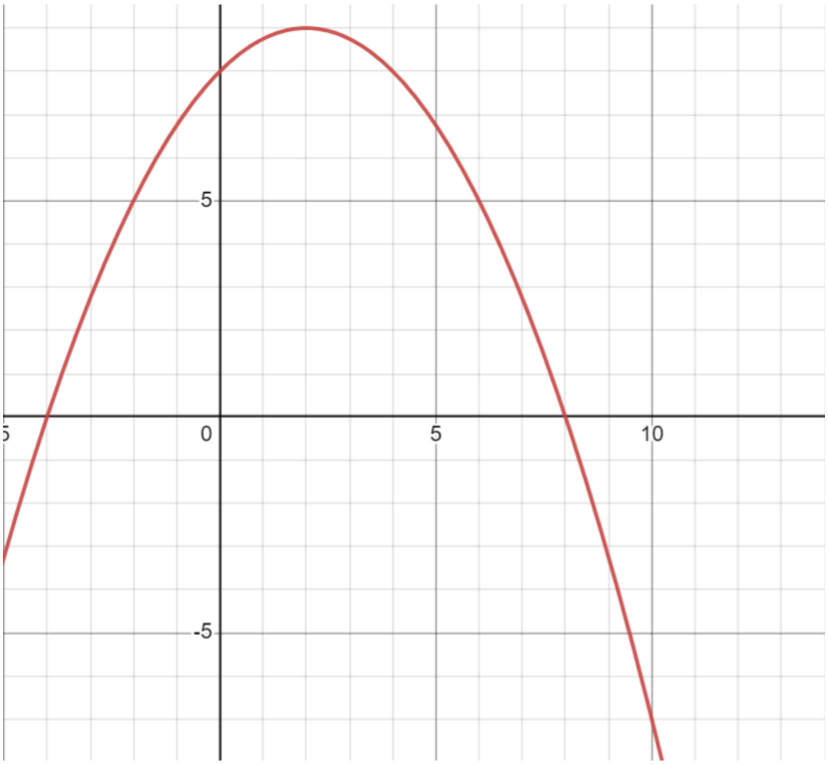
b) Prove that $a(t) = -k^2x(t)$. (3 marks)

c) Find the exact speed of the particle at $t = \frac{11\pi}{12}$ (1 mark)

d) Find the change of displacement when the speed of the particle is $4\ ms^{-1}$ for the first $\frac{\pi}{2}$ seconds (5 marks)

Question 2 **(6 marks)**

A function $x = f(y)$ is shown below.



It is given that $p < \int_{-4}^{10} |f(y)|\, dy < q$. By finding p and q, interpret what this statement ($p < \int_{-4}^{10} |f(y)|\, dy < q$) means by further on finding $\int_{-4}^{10} |f(y)|\, dy$.

Question 3 **(9 marks)**

Given the following marginal analysis data

$$C'(x) = 3\cos x \sin^2 x + 5e^{3x}, \qquad C(0) = 0$$

$$R'(x) = 6\cos x \sin^2 x + e^{3x} + 2x(10x^2 - 3)^3 + \frac{1}{\cos^2 x}, \qquad R(0) = 0$$

Find $C(x)$ and $R(x)$, with full working out. (6 marks)

By finding the cost and revenue function..

a) Find the total cost of producing 10 items (1 mark)

b) Find the average profit when 10 items are produced and sold. (3 marks)

Question 4 **(8 marks)**

The fundamental theorem of calculus is derived by a long algebraic method. To simply explain this, they say that $A = \lim_{n \to \infty} (sum\ of\ areas\ of\ rectangular\ strips)$, depending on the function. This means the exact area A of the region under the curve, which then simplifies to…

$$A = \lim_{\delta x \to 0} \sum_{x=0}^{x=n} f(x)\, \delta x$$

By interpreting on the information given, what does the expression above actually mean. Express your answer in a basic expression. (3 marks)

By this formula of A, they have deducted the formula for the fundamental theorem of calclus. which is…

$$\frac{d}{dx}(\int_{a}^{x} f(t)\, dt) = f(x)$$

Hence, find $f(x)$. (2 marks)

a) $\frac{d}{dx}(\int_{\pi}^{x} \frac{\sqrt[2]{2t^2-4t+3}}{9t-3} dt)$

b) $\frac{d}{dx}(\int_{3!}^{x} \frac{1}{2}\left(\frac{\tan(t)+e^{\frac{1}{2}t}-5(3t^2-2t)^9-10}{\sqrt{4t^2+\sin(t)+10}}\right)$

Why doesn't the expressions below not work for the fundamental theorem of calculus?

$$\frac{d}{dx}(\int_{3}^{x^2} \left(\frac{t}{t+1}\right) dt \qquad and \qquad \frac{d}{dx}(\int_{1}^{x} \left(\frac{\sqrt{2t-4}}{t+1}\right) dt$$

Hence, evaluate the real expression from the two. (2 marks)

END OF CALCULATOR-ASSUMED

Additional working space

Question number: ___________