



Course Methods test 2 Year 12

Student name: _____ Teacher name: _____

Task type: Response

Time allowed for this task: 40 mins

Number of questions: 8

Materials required: Calculator with CAS capability (to be provided by the student)

Standard items: Pens (blue/black preferred), pencils (including coloured),

sharpeners, correction fluid/tape, eraser, ruler, highlighters

Special items:

Drawing instruments, templates, notes on one unfolded sheet of

A4 paper, and up to three calculators approved for use in the

WACE examinations

Marks available: 41 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 & 3 = 6 marks) (3.2.9)

Determine y in terms of x for the following. Show all working.

a) $\frac{dy}{dx} = 15x^2 + 14x$ and $y = 13$ when $x = 1$.

b) $\frac{dy}{dx} = 10(2x + 1)^4$ and $y = 10$ when $x = -1$.

Q2 (3 & 2 = 5 marks) (3.2.22, 3.2.5)

A car travels in a straight line from the origin, initially at rest, with constant acceleration $4\cos(3t) \text{ m/s}^2$ with t time in seconds.

a) Determine the distance from the origin at $t = \frac{\pi}{3}$ seconds?

b) What is the velocity of the car at $t = \frac{\pi}{3}$ seconds?

Q3 (2 marks) (3.2.19)

Determine the exact area between $y = x^3 + x^2 - 37x + 35$ and the x axis from $x = -10$ to $x = 10$.

Q4 (2, 2 & 3 = 7 marks) (3.2.18)

A factory produces electric vehicles. The total number, E , that the company has produced t months after production commenced is such that:

$$\frac{dE}{dt} = 450 - \frac{800}{(t + 5)^2}$$

a) The first 6 months
Determine the number produced in

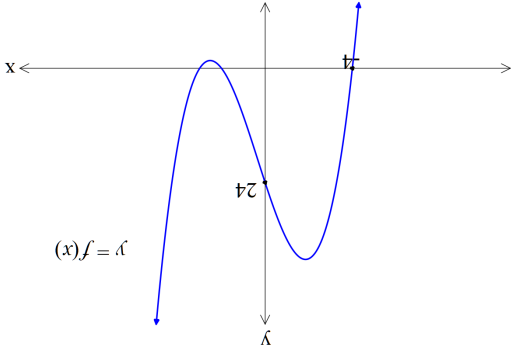
b) The third month

Determine the minimum number of months required to produce:
c) 10000 vehicles.

Q8 (5 marks) (3.1.15)

Consider the function $f(x) = ax^3 + bx^2 + cx + d$ where a, b, c & d are constants.

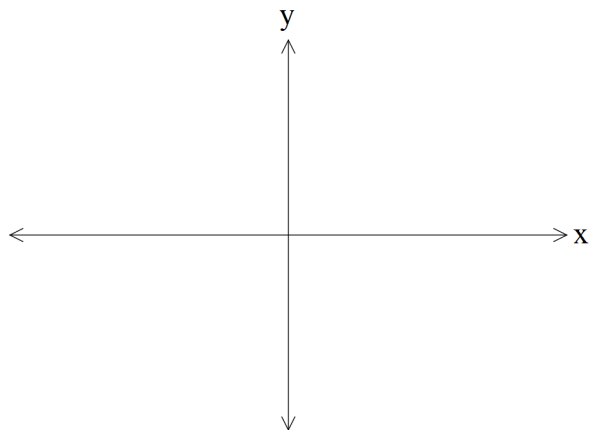
Below is a graph of $f(x)$
(Note: diagram is not drawn to scale)



There is an x intercept at $x = -4$, y intercept at $y = 24$ and $\int_{-4}^4 f(x)dx = \frac{368}{3}$.
There is an inflection point at $x = \frac{1}{3}$.
Determine the exact values of a, b, c & d .

Q5 (5 & 3 = 8 marks) (3.2.20)

- a) On the axes below, sketch the following graphs: $y = x^3 + 2x^2$ and $y = 5x - 2x^2$. Indicate on your sketch coordinates (one decimal place) of any stationary points, and label their nature, and of any points where the graphs intersect each other.



- b) Determine the exact area between $y = x^3 + 2x^2$ and $y = 5x - 2x^2$.

Q6 (2 & 2 = 4 marks) (3.1.3, 3.1.4)

The number of kangaroos, N , in a particular site that have developed disease W are increasing such that $\frac{dN}{dt} = 0.08N$ with t the time in years. There are initially 2300 kangaroos with the disease.

- a) Determine the number of kangaroos with disease W in 5 years' time.
- b) Determine the time taken to triple the number with the disease in years to one decimal place.

Q7 (4 marks) (3.2.16)

Consider the function $G(x) = \int f(t) dt$ such that $G'(x) = \frac{3}{4x^2}$ and $G(4) = \frac{79}{2}$. Determine the rule for the function $f(x)$.