## YEAR 12 MATHEMATICS METHODS

# MESTEA COTTEGE SEWIEZLEB ONE 5018

## By daring & by doing TEST 4: ANTIDIFFERENTIATION, APPLICATIONS OF CALCULUS AND FUNDAMENTAL THEOREM OF CALCULUS

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_	Thursday 24 May			

- Answer all questions neatly in the spaces provided. Show all working.
- You are permitted to use the Formula Sheet for both sections, and an A4 page of notes, plus up to 3 permitted calculators in the Calculator Allowed section.

Calculator Free

J. [ 6 marks]

Determine the anti-derivative of

 $z(x\xi - 4)$  (e

 $\frac{x}{6} - {}_{t}x$ g (q

c)  $\frac{x_5+2}{70x}$  [5]

[7]

[7]

## 2. [ 4 marks]

Determine the following, simplyfying your answers:

a) 
$$\int \frac{1-x^3}{x^2} dx$$

b) 
$$\frac{d}{dx} \left( \int_x^7 \frac{2t}{t^2 - 5} dt \right)$$

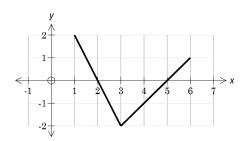
[2]

[2]

## 3. [ 3 marks]

Let the graph of f(x) between x = 1 and x = 6 be as shown.

Evaluate  $\int_1^6 f(x) \ dx$ .



a = k(2t - 5), where k is a positive constant. A particle P moves in a straight horizontal line such that its acceleration at time t seconds is given by

Given that at time t=0, p is at rest at the origin and that at time t=0, its velocity is 1.5 ms.

a) find the acceleration of P in terms of t.

[7]

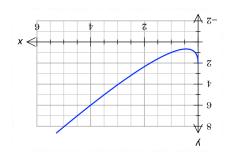
[8]

b) show that the displacement of the particle, x metres, from O at time t is given by

$$(2t - 15)^2 \frac{1}{4} = x$$

4. [ 7 marks]

A sketch of the curve C with equation  $y=3x-4\sqrt{x}+2$  has been given below.



has x-coordinate 4. a) Using the tankine command, or otherwise, determine the equation of the tangent, which

Draw the tangent on the sketch.

9. [5 marks]

tangent to C at A and the positive coordinate axes and state the area. b) Write down the integral(s) that will determine the area of the region captured by C, the [7]

[8]

### 5. [ 4 marks]

Use  $\int_{-2}^{4} f(x) dx = 8$  and  $\int_{-2}^{1} f(x) dx = 1$  to evaluate the following:

a) 
$$\int_{-2}^{4} -5f(x) dx$$

(1) b) 
$$\int_{1}^{4} f(x) dx$$

c) 
$$\int_{-2}^{4} [f(x) - 2x] dx$$

[2]

[1]

#### 6. [3 marks]

The rate of flow of a liquid into a container is given by  $\frac{dV}{dt}=e^{0.5t}$ , where V is the volume in cubic centimetres and t is the time in seconds.

Find the volume of liquid in the container after 3 seconds if the container intially holds 10 cm<sup>3</sup>.



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(16 marks)

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- 7. [5 marks]
  - a) Find  $\frac{dy}{dx}$  given  $y = x \cdot \sin x$

b) Use your answer to part (a) to find  $\int (x.\cos x)dx$ 

[3]

[2]

#### 8. [6 marks]

The velocity of a body moving along a straight line is given by  $v = -3t^2 - 2t + 5$  m/s where t is the time in seconds. The initial displacement of the body from a fixed point O is 3 metres.

a) Find the displacement of the body when t = 5.

- b) Find the instantaneous speed at t = 5 seconds
- c) What is the average speed of the body over the first 5 seconds?

[2]

[1]