



SHENTON  
COLLEGE

Year 12 Mathematics Methods (ATMAM)

Test 2 2017

Calculator Free

Time Allowed: 25 minutes

Marks / 27

Name: .....

Circle Your Teachers Name:

Mrs Friday

Mr Smith

Question 1 [ 3,3,2 ]

Determine the following:

(a)  $\int (4x^3 + 2\sqrt[3]{x} - \frac{x}{4})dx$

(b)  $\int (\frac{e^{2x+e-3x}}{e^x})dx$

(c)  $\int 2\sin 3x + \cos(4x + \pi)dx$

Question 2 [ 3,3 ]

Evaluate

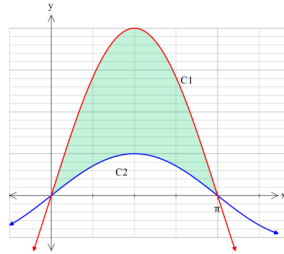
(a)  $\int_6^2 \frac{\sqrt{2x-3}}{1} dx$

(b)  $\int_{\frac{\pi}{2}}^0 (\cos 3\theta + \sin 3\theta)d\theta$

**Question 3 [ 1,3 ]**

The illustrated curves are the graphs of  
 $y = \sin x$  and  $y = 4\sin x$ .

(a) Identify each curve



(b) Determine the shaded area.

**Question 4 [ 1,1,2 ]**

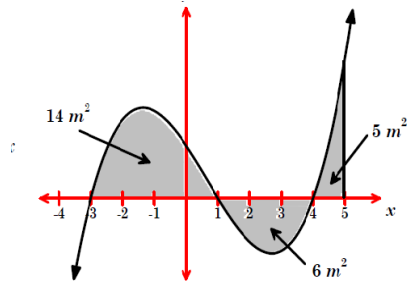
For the graph of  $y = h(x)$  to the right the areas between the curve and the x-axis are shown.

Use this to state the value of the following integrals.

(a)  $\int_{-3}^5 h(x) dx$

(b)  $\int_5^4 h(x) dx$

(c)  $\int_{-3}^1 [h(x) + 2] dx$



Question 9 [ 2,1 ]

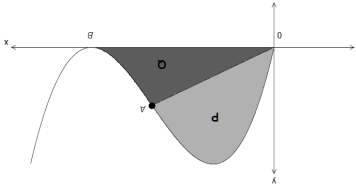
Consider the function  $f(x) = (x - 4)(x + 1)(2x + 7)$

- (a) Write down a sum of integrals which when evaluated could be used to determine the area trapped by  $f(x)$  and the  $x - axis$ .
- (b) Calculate the area.

Question 5 [ 5 ]  
The function  $y = f(x)$  passes through the point  $(0,-1)$ . A tangent to  $f(x)$  has a gradient of 3 at that point.  
 $f'''(x) = 80(2x - 1)^3$ . Determine the function  $f(x)$ .

Question 10 [ 2,3,2 ]

The diagram below shows part of the curve  $y = x(x - 3)^2$ , which passes through the point of inflection at A and touches the  $x$ -axis at B.



- (a) Locate the coordinates of the points A and B.
- (b) Find area of the region labelled P. Indicate the integral you used.
- (c) Find the area of the region labelled Q.

End of test

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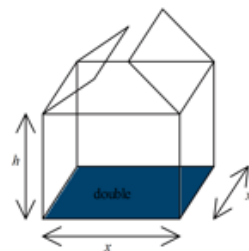
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### Question 6 [1,2,3,1]

A manufacturer produces cardboard boxes that have a square base. The top of each box consists of a double flap that opens as shown. The base of the box has a double layer of cardboard for strength. Each box must have a volume of 12 cubic metres.



- (a) Show that the area of cardboard required is given by  $C = 3x^2 + 4xh$

- (b) Express  $C$  as a function of  $x$  only.

- (c) Use calculus to determine what dimensions will minimise the amount of cardboard used.

- (d) What is the minimum area of cardboard used?

### Question 7 [4]

Use calculus to estimate the percentage change in  $y$  for  $y = 2x^3$  when  $x$  decreases by 2%

### Question 8 [1,2,3]

The cost of producing  $x$  items of a product is given by  $\$[5x + 2000e^{-0.01x}]$ . Each item is sold for \$24.90.

- (a) Write an equation to describe  $R(x)$ , the revenue from selling the product .

- (b) Write an equation for  $P(x)$ , the profit function.

- (c) Demonstrate the use of calculus to find the profit associated with the sale of the 501<sup>st</sup> item at the point in production where 500 items are produced.