

Thursday 24 May

Name: \_\_\_\_\_

Time: 45 minutes

Part A:  $\frac{27}{16}$

Part B:  $\frac{16}{43}$

Total:  $\frac{43}{48}$

%

Calculator Free

1. [ 6 marks]

Determine the anti-derivative of

a)  $(4 - 3x)^2$

[2]

b)  $5x^4 - \frac{\sqrt{x}}{9}$

[2]

c)  $\frac{10x}{x^2+5}$

[2]

2. [ 4 marks]

Determine the following, simplifying your answers:

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

[2]

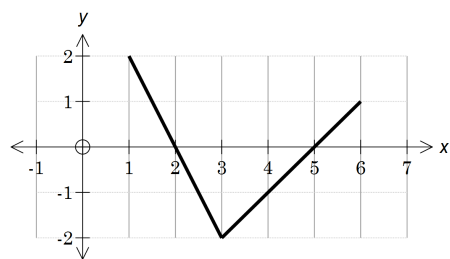
b)  $\frac{d}{dx} \left( \int_x^7 \frac{2t}{t^2-5} dt \right)$

[2]

3. [ 3 marks]

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

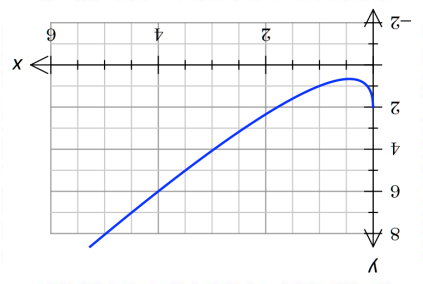
Evaluate  $\int_1^6 f(x) dx$ .



[3]

9. [5 marks]

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



- a) Using the tanline command, or otherwise, determine the equation of the tangent, which has x-coordinate 4.  
Draw the tangent on the sketch.

[3]

- b) Write down the integral(s) that will determine the area of the region captured by C, the tangent to C at A and the positive coordinate axes and state the area.
- [2]

[4]

- b) show that the displacement of the particle,  $x$  metres, from  $O$  at time  $t$  is given by
- $$x = \frac{1}{24}t^2(2t - 15)$$

[3]

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)  $\int_1^4 f(x) dx$

[1]

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

[2]

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 initially holds  $10 \text{ cm}^3$ .

[3]



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(16 marks)

Resourced

7. [5 marks]

a) Find  $\frac{dy}{dx}$  given  $y = x \cdot \sin x$

[2]

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

[3]

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  $t = 5$ .

[2]

b) Find the instantaneous speed at  $t = 5$  seconds

[1]

c) What is the average speed of the body over the first 5 seconds?

[3]