

# Practice paper 2

Full marks are not necessarily awarded for a correct answer with no working. Answers must be supported by working and/or explanations. In particular, solutions found from a graphic display calculator should be supported by suitable working, e.g. if graphs are used to find a solution, you should sketch these as part of your answer. Where an answer is incorrect, some marks may be given for a correct method, provided this is shown by written working. You are therefore advised to show all working.

- [Maximum mark: 6]

- [illegible]

- 2** Find the equation of the normal to the curve  $y = \ln \sqrt{2x-1}$  at the point of intersection with the  $x$ -axis.

[Maximum mark: 5]

This image shows a single page of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

- 3** The set of values  $\{8, 5, 6, a, b\}$  has a mean value of 6.4 and the variance of 1.04. Find the values of  $a$  and  $b$  ( $a < b$ ).

[Maximum mark: 6]

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- 4** Two objects are 100 metres apart. They start moving in the same direction as given on the diagram below.



The distance traveled by the first object is given by the formula

$s = \frac{1}{2}t^2, t \geq 0$ . The second object moves with a constant velocity of 5 m/s.

[Maximum mark: 5]

- a** Show that the time  $t$  when the first object meets the second object satisfies the equation  $\frac{1}{2}t^2 - 5t - 100 = 0$ .
- b** Find the rate of change of the distance when the first object overtakes the second object.

[illegible]

**5** A system of equations is given by 
$$\begin{cases} \sin x + \cos y = 1 \\ x = e^{\frac{y}{2}} + 1 \end{cases}$$

[Maximum mark: 6]

- Express  $y$  in terms  $x$  in both equations.
- Hence solve the system for  $0 < x < \pi$ ,  $0 < y < \pi$ .

[illegible]

- 6** A continuous random variable  $X$  has a probability density function

$$f(x)=\begin{cases} ke^{-x^2}, & 0 \leq x \leq 2 \\ 0, & \text{otherwise} \end{cases}$$

[Maximum mark: 6]

- Explain why  $k > 0$ .
- Find the value of  $k$ .
- Hence find  $E(X)$ .

[illegible]

**7** Solve the simultaneous equations

[Maximum mark: 7]

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[Maximum mark: 6]

**a** Show that  $\int_{-a}^a f(x) \, dx = 2 \int_0^a f(x) \, dx$ .

**b** Show that  $\int_{-a}^a g(x) dx = 0$ .

[illegible]

- 9** Given that  $x_1$ ,  $x_2$  and  $x_3$  are solutions of the equation  $2x^3 - 3x^2 + 4x - 5 = 0$ , without solving it find  $x_1^2x_2x_3 + x_1x_2^2x_3 + x_1x_2x_3^2$ .

*[Maximum mark: 5]*

[illegible]

[Maximum mark: 8]

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[Maximum mark: 15]

- Explain why the function does not have any vertical asymptotes.
- Find the  $y$ -intercept of  $y = f(x)$ .
- Find the  $x$ -intercepts,  $p$  and  $q$  (where  $p < q$ ).
- Sketch the graph of  $y = f(x)$ , labeling any stationary points,  $p$ ,  $q$  and the  $y$ -intercept.
- Given that  $g(x) = \sin(2x)$ ,  $0 \leq x \leq 2\pi$ , for what values of  $x$  is  $f(x) > g(x)$ ?
- Hence or otherwise calculate the maximum value of  $h(x) = f(x) - g(x)$ ,  $0 \leq x \leq 2\pi$ .

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Handwriting practice lines consisting of 40 horizontal dotted lines.

[Maximum mark: 17]

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Handwriting practice lines consisting of 40 horizontal dotted lines.

- [Maximum mark: 15]

A pole can be used as an oil lamp stand if its length is between 1.75 and 2.15 m.

- Three poles are taken from the stack of produced wooden poles.

- d** Given that at least one pole satisfies the standards, find the probability that all three poles satisfy the standards of the oil lamp stand.

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Handwriting practice lines consisting of 40 horizontal dotted lines.

[Maximum mark: 13]

- a** Determine the domain and the range of the function  $f$ .  
Find the first two positive zeroes of the function, and give your answer in terms of  $\pi$ .
- c** Calculate the area of the region enclosed by the curve and the  $x$ -axis up to the second positive zero.
- d** The region in part **c** is rotated for  $2\pi$  about the  $x$ -axis. Find the volume of the solid generated by the revolution.

[illegible]

Handwriting practice lines consisting of 40 horizontal dotted lines.