OCR
Oxford Cambridge and RSA

A Level Mathematics B (MEI)

H640/02 MEI Pure Mathematics and Statistics

Pure

Question Set 5

1 Show that $\sqrt{27}+\sqrt{192}=a\sqrt{b}$, where a and b are prime numbers to be determined. **[2]**

2 Solve the inequality $|2x+1|<5$. **[3]**

3 **(a)** **(i)** Sketch the graph of $y=3^x$. **[1]**

(ii) Give the coordinates of any intercepts. **[1]**

The curve $y=f(x)$ is the reflection of the curve $y=3^x$ in the line $y=x$.

(b) Find $f(x)$. **[1]**

4 **(a)** Express $7\cos x-24\sin x$ in the form $R\cos(x+a)$, where $0<\alpha<\frac{\pi}{2}$. **[3]**

(b) Write down the range of the function

$$f(x)=12+7\cos x-24\sin x, \quad 0\leqslant x\leqslant 2\pi.$$

[2]

5 Find $\int\left(4\sqrt{x}-\frac{6}{x^3}\right)dx$. **[4]**

6 **You must show detailed reasoning in this question.**

The equation of a curve is

$$y^3-xy+4\sqrt{x}=4.$$

Find the gradient of the curve at each of the points where $y=1$. **[9]**

7 In the first year of a course, an A-level student, Aaishah, has a mathematics test each week. The night before each test she revises for t hours. Over the course of the year she realises that her percentage mark for a test, p, may be modelled by the following formula, where A, B and C are constants.

$$p=A-B(t-C)^2$$

- Aaishah finds that, however much she revises, her maximum mark is achieved when she does 2 hours revision. This maximum mark is 62.
- Aaishah had a mark of 22 when she didn't spend any time revising.

(a) Find the values of A, B and C. **[3]**

(b) According to the model, if Aaishah revises for 45 minutes on the night before the test, what mark will she achieve? **[2]**

(c) What is the maximum amount of time that Aaishah could have spent revising for the model to work? **[2]**

In an attempt to improve her marks Aaishah now works through problems for a total of t hours over the three nights before the test. After taking a number of tests, she proposes the following new formula for p.

$$p = 22 + 68(1 - e^{-0.8t})$$

For the next three tests she recorded the data in Fig. 7.

t	1	3	5
p	59	84	89

Fig. 7

(d) Verify that the data is consistent with the new formula. **[2]**

(e) Aaishah's tutor advises her to spend a minimum of twelve hours working through problems in future. Determine whether or not this is good advice. **[2]**

8 (a) Express $\dfrac{(x^2 - 8x + 9)}{(x+1)(x-2)^2}$ in partial fractions. **[5]**

(b) Express y in terms of x given that

$$\frac{dy}{dx} = \frac{y(x^2 - 8x + 9)}{(x+1)(x-2)^2} \text{ and } y = 16 \text{ when } x = 3.$$

[7]

Total Marks for Question Set 5: 49

Resource Materials

Question Set No: 5

Fig. 7

t	1	3	5
p	59	84	89

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