

LJW 6A1

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PEPERIKSAAN PERCUBAAN STPM
MATHEMATICS T

1 Show that $[(A \cap B)' \cap A] \cup [(A \cap B)' \cap B] = (A - B) \cup (B - A)$, where A and B are any two sets. [5 marks]

2 Given that $\log_2 x + 2 \log_4 y = 3$, show that $xy = 8$. Hence, solve for x and y which satisfy the simultaneous equations $\log_{10}(2x + y) = 1$ and $\log_2 x + 2 \log_4 y = 3$. [6 marks]

3 Find the equations of the tangents to the curve $x^2 - y^2 + 6xy = 9$ at the points where the curve intersects the x -axis. [6 marks]

4 Express $\frac{1}{\sqrt{1+2x}}$ as a series of ascending powers of x until the term x^3 , where $|x| < \frac{1}{2}$. By taking $x = \frac{1}{50}$, find $\sqrt{26}$ correct to three decimal places. [7 marks]

5 Solve the equation $3|x| = |x - 2|$. [3 marks]

On the same coordinate axes, sketch the graphs of $y = 3|x|$ and $y = |x - 2|$. Hence, solve the inequality $3|x| > |x - 2|$. [4 marks]

6 The points $P(4, 3)$, $Q(3, -2)$, $R(-3, 8)$ and $S(\alpha, \beta)$ are vertices of a parallelogram PQRS. Determine the values of α and β . [4 marks]

Find the shortest distance from P to QS . Hence, find the area of the parallelogram PQRS. [3 marks]

7 Sketch the graph of $y = e^{-x^2}$. Show clearly the turning point and state the equation of the asymptote. [4 marks]

Use the trapezium rule with six ordinates to estimate the area bounded by the curve, the x -axis and the lines $x = 1$ and $x = 2$, giving your answer correct to three decimal places. [4 marks]

8 Find the inverse matrix of $A = \begin{pmatrix} 2 & 1 & -1 \\ 1 & -1 & 0 \\ 4 & 3 & 1 \end{pmatrix}$. [4 marks]

Hence, solve the simultaneous equations $2x_1 + x_2 - x_3 = 15$, $x_1 - x_2 = 2$ and $4x_1 + 3x_2 + x_3 = 47$. [4 marks]

9 Given that the polynomial $p(x) = x^3 + ax^2 + bx + 10$ has a factor of $(x + 2)$ and that when divided by $(x - 3)$, the remainder is 10.

(a) Find the values of a and b . [4 marks]

(b) Find the other real factor of $p(x)$ and show that this factor is positive for all real values of x . [3 marks]

10. R is the region bounded by the axes and the part of the curve $y^2 = 4a(a-x)$ in the first quadrant. Find in terms of a
- (a) the area of R [3 marks]

$$y^2 = 4a(a-x) \quad \sqrt{4a^2 - 4ax}$$

- (b) the volume V_x , of the solid formed when R is rotated completely about the x-axis. [3 marks]

The volume of the solid formed when R is rotated about the y-axis is V_y . Show that

$$V_y = \frac{8}{15} V_x \quad [3 \text{ marks}]$$

The region S, lying in the first quadrant, is bounded by the curve $y^2 = 4a(a-x)$ and the lines $x = a$ and $y = 2a$. Find, in terms of a, the volume of the solid formed when S is rotated completely about the y-axis.



[2 marks]

11. The equation of a curve C is

$$y = 1 + \frac{6}{x-3} - \frac{24}{x+3}$$

- (a) Write down the equations of the asymptotes [2 marks]
- (b) Find the coordinates of the points where C meets the axes [2 marks]
- (c) Find the coordinates of the stationary points of C. [4 marks]
- (d) Sketch C [3 marks]

12. The function f is defined as

$$f(x) = \begin{cases} 5 - |x+1|, & -6 < x < 1 \\ x^2 - 6x + 8, & 1 \leq x < 4 \end{cases}$$

- (a) Find $\lim_{x \rightarrow 1^-} f(x)$ and $\lim_{x \rightarrow 1^+} f(x)$.
Hence, determine whether f is continuous at $x = 1$. [3 marks]
- (b) Sketch the graph of f . [4 marks]
- (c) Determine the range of f . [2 marks]
- (d) Determine the set of values of x so that $f(x) > 2 - x$. [5 marks]