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TUTGATHER PRACTICE PAPER

HONG KONG DIPLOMA OF SECONDARY EDUCATION EXAMINATION 2027

MATHEMATICS Extended Part Module M1
PAPER

Question-Answer Book

Candidate Number

TUTGATHER
PRACTICE PAPER · NOT AN OFFICIAL HKEAA PAPER

1 hour 5 minutes

This paper must be answered in English

Topic practice: Differentiation of a Function

INSTRUCTIONS

(1) This paper consists of THREE sections, A(1), A(2) and B.

(2) Attempt ALL questions in this paper. Write your answers in the spaces provided in this Question-Answer Book. Do not write in the margins.

(3) Unless otherwise specified, all working must be clearly shown.

(4) Unless otherwise specified, numerical answers should be either exact or correct to 3 significant figures.

(5) The diagrams in this paper are not necessarily drawn to scale.

(6) Calculators and mathematical drawing instruments may be used.

(7) The marks for each question are shown in brackets.

(8) No extra time will be given after the 'Time is up' announcement.

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SECTION A(1) (16 marks)

1. Differentiate $y = (3x^2 + 2x - 1)(x^3 - 4x)$ with respect to x. **(3 marks)**

2. Find $\frac{dy}{dx}$ if $y = e^{2x} \ln(3x + 1)$. **(3 marks)**

3. Differentiate $y = \frac{x^2 + 1}{\sqrt{x}}$ with respect to x. Simplify your answer. **(4 marks)**

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4. Let $f(x) = x^2 e^{-x}$. **(6 marks)**

(a) Find $f'(x)$ and $f''(x)$.

(b) Solve $f'(x) = 0$.

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SECTION A(2) (24 marks)

5. Let $y = \frac{x^2 + 3x + 1}{x - 1}$. **(7 marks)**

(a) Find $\frac{dy}{dx}$.

(b) Find the equations of all tangents to the curve that are parallel to the line $y = 5x + 2$.

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6. Let $f(x) = \ln(x^2 + 1)$. **(8 marks)**

(a) Find $f'(x)$ and $f''(x)$.

(b) Find the x-coordinates of the points of inflection of the graph of $y = f(x)$.

(c) Determine whether the graph is concave upwards or concave downwards at $x = 0$.

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7. A curve is given by $x^2 y + y^3 = 10$. **(9 marks)**

(a) Find $\frac{dy}{dx}$ in terms of x and y.

(b) Find the equation of the tangent to the curve at the point $(1, 2)$.

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SECTION B (10 marks)

8. Let $f(x) = xe^{-x}$ for $x > 0$. **(10 marks)**

(a) Find $\dot{f}(x)$ and $\ddot{f}(x)$.

(b) Find the coordinates of the turning point of the graph of $y = f(x)$ and determine its nature.

(c) Find the x-coordinate of the point of inflection of the graph of $y = f(x)$.

(d) Sketch the graph of $y = f(x)$ for $x > 0$, indicating clearly the turning point and the point of inflection.

END OF PAPER

Answers written in the margins will not be marked.

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