A LEVEL Cambridge Topical Past Papers

PURE MATHEMATICS 3

2017 — 2023

Chapter 1	**ALGEBRA**	Page 1
Chapter 2	**LOGARITHMIC & EXPONENTIAL FUNCTIONS**	Page 70
Chapter 3	**TRIGONOMETRY**	Page 102
Chapter 4	**DIFFERENTIATION**	Page 158
Chapter 5	**INTEGRATION**	Page 226
Chapter 6	**DIFFERENTIATION EQUATIONS**	Page 312
Chapter 7	**NUMERICAL METHODS**	Page 362
Chapter 8	**COMPLEX NUMBERS**	Page 429
Chapter 9	**VECTORS**	Page 496
	ANSWERS	Page 559

PURE MATHEMATICS P3 9709

TOPICAL PAST PAPER WORKSHEETS

2017 - 2023 | Questions + Mark scheme

AVAILABLE PAPERS

P1	P3	P4	P5	P6
490 Questions	432 Questions	299 Questions	287 Questions	257 Questions

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TOPICS	P3
ALGEBRA	63
LOGARITHMIC & EXPONENTIAL FUNCTIONS	32
TRIGONOMETRY	48
DIFFERENTIATION	59
INTEGRATION	66
DIFFERENTIATION EQUATIONS	39
NUMERICAL METHODS	37
COMPLEX NUMBERS	49
VECTORS	39

1 - (9709/31_Summer_2017_Q1) - *Algebra*

Solve the inequality $|2x + 1| < 3|x - 2|$. [4]

2 – (9709/31_Summer_2017_Q2) – *Algebra*

Expand $\frac{1}{\sqrt[3]{(1+6x)}}$ in ascending powers of x, up to and including the term in x^3, simplifying the coefficients. [4]

3 - (9709/32_Summer_2017_Q2) - *Algebra*

Solve the inequality $|x - 3| < 3x - 4$. [4]

4 - (9709/32_Summer_2017_Q8) - *Algebra*

Let $\mathrm{f}(x) = \dfrac{5x^2 - 7x + 4}{(3x + 2)(x^2 + 5)}$.

(i) Express $\mathrm{f}(x)$ in partial fractions. [5]

(ii) Hence obtain the expansion of $\mathrm{f}(x)$ in ascending powers of x, up to and including the term in x^2. [5]

5 - (9709/33_Summer_2017_Q2) - *Algebra*

Expand $(3 + 2x)^{-3}$ in ascending powers of x up to and including the term in x^2, simplifying the coefficients. [4]

ANSWERS

1 – (9709/31_Summer_2017_Q1) – *Algebra*

EITHER: State or imply non-modular inequality $(2x+1)^2 < (3(x-2))^2$, or corresponding quadratic equation, or pair of linear equations $(2x+1) = \pm 3(x-2)$	**(B1**
Make reasonable solution attempt at a 3-term quadratic e.g. $5x^2 - 40x + 35 = 0$ or solve two linear equations for x	**M1**
Obtain critical values $x = 1$ and $x = 7$	**A1**
State final answer $x < 1$ and $x > 7$	**A1)**
OR: Obtain critical value $x = 7$ from a graphical method, or by inspection, or by solving a linear equation or inequality	**(B1**
Obtain critical value $x = 1$ similarly	**B2**
State final answer $x < 1$ and $x > 7$	**B1)**
Total:	**4**

2 – (9709/31_Summer_2017_Q2) – *Algebra*

EITHER: State a correct unsimplified version of the x or x^2 or x^3 term in the expansion of $(1+6x)^{-\frac{1}{3}}$	**(M1**
State correct first two terms $1-2x$	**A1**
Obtain term $8x^2$	**A1**
Obtain term $-\frac{112}{3}x^3$ $\left(37\frac{1}{3}x^3\right)$ in final answer	**A1)**
OR: Differentiate expression and evaluate $f(0)$ and $f'(0)$, where $f'(x) = k(1+6x)^{-\frac{4}{3}}$	**(M1**
Obtain correct first two terms $1-2x$	**A1**
Obtain term $8x^2$	**A1**
Obtain term $-\frac{112}{3}x^3$ in final answer	**A1)**
Total:	**4**

3 – (9709/32_Summer_2017_Q2) – *Algebra*

EITHER: State or imply non-modular inequality $(x-3)^2 < (3x-4)^2$, or corresponding equation	**(B1**
Make reasonable attempt at solving a three term quadratic	**M1**
Obtain critical value $x = \frac{7}{4}$	**A1**
State final answer $x > \frac{7}{4}$ only	**A1)**
*OR*1: State the relevant critical inequality $3 - x < 3x - 4$, or corresponding equation	**(B1**
Solve for x	**M1**
Obtain critical value $x = \frac{7}{4}$	**A1**
State final answer $x > \frac{7}{4}$ only	**A1)**
*OR*2: Make recognizable sketches of $y = \lvert x-3 \rvert$ and $y = 3x - 4$ on a single diagram	**(B1**
Find x-coordinate of the intersection	**M1**
Obtain $x = \frac{7}{4}$	**A1**
State final answer $x > \frac{7}{4}$ only	**A1)**
Total:	**4**

4 – (9709/32_Summer_2017_Q8) – *Algebra*

(i)	State or imply the form $\frac{A}{3x+2}+\frac{Bx+C}{x^2+5}$	**B1**
	Use a relevant method to determine a constant	**M1**
	Obtain one of the values $A = 2$, $B = 1$, $C = -3$	**A1**
	Obtain a second value	**A1**
	Obtain the third value	**A1**
	Total:	**5**
(ii)	Use correct method to find the first two terms of the expansion of $(3x+2)^{-1}$, $(1+\frac{3}{2}x)^{-1}$, $(5+x^2)^{-1}$ or $(1+\frac{1}{5}x^2)^{-1}$ [Symbolic coefficients, e.g. $\binom{-1}{2}$ are not sufficient]	**M1**
	Obtain correct unsimplified expansions up to the term in x^2 of each partial fraction. The FT is on A, B, C. from part (i)	**A1FT + A1FT**
	Multiply out up to the term in x^2 by $Bx+C$, where $BC \neq 0$	**M1**
	Obtain **final answer** $\frac{2}{5}-\frac{13}{10}x+\frac{237}{100}x^2$, or equivalent	**A1**
	Total:	**5**