

Cambridge International AS & A Level

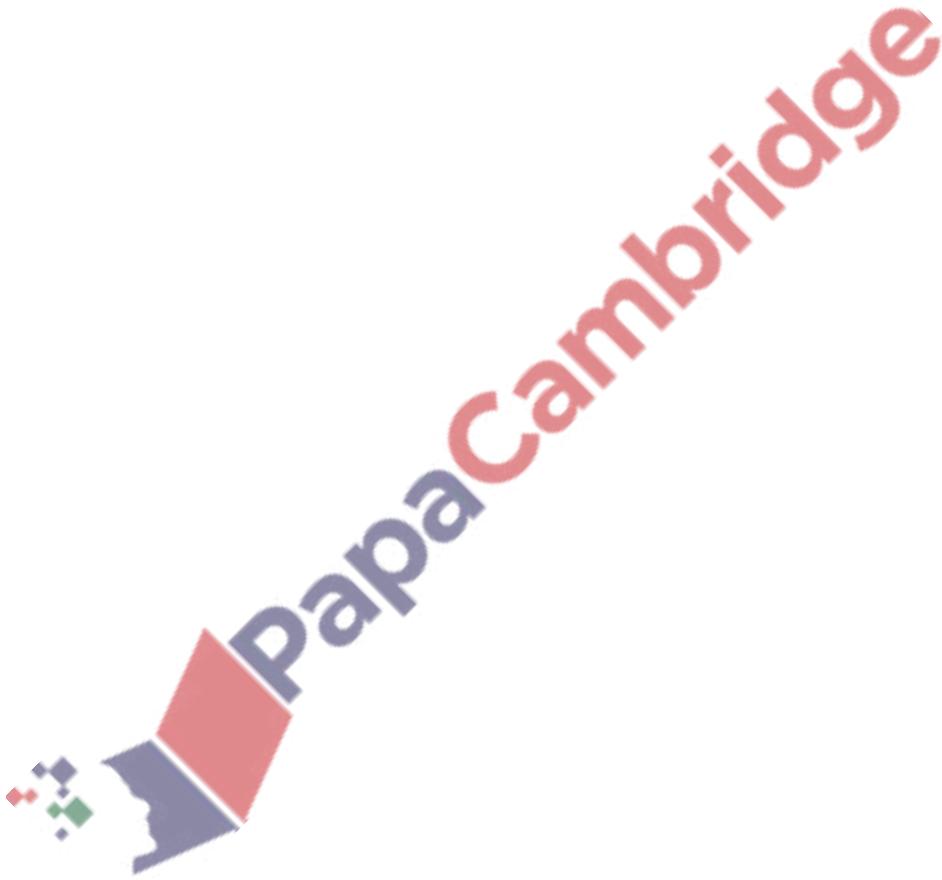
# MATHEMATICS (9709) P3

TOPIC WISE QUESTIONS + ANSWERS | COMPLETE SYLLABUS



# Chapter 1

## Algebra



1. 9709\_s20\_qp\_31 Q: 2

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

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- (b) State the set of values of  $x$  for which the expansion is valid. [1]

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6. 9709\_w20\_qp\_32 Q: 2

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

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- (b) State the set of values of  $x$  for which the expansion is valid. [1]

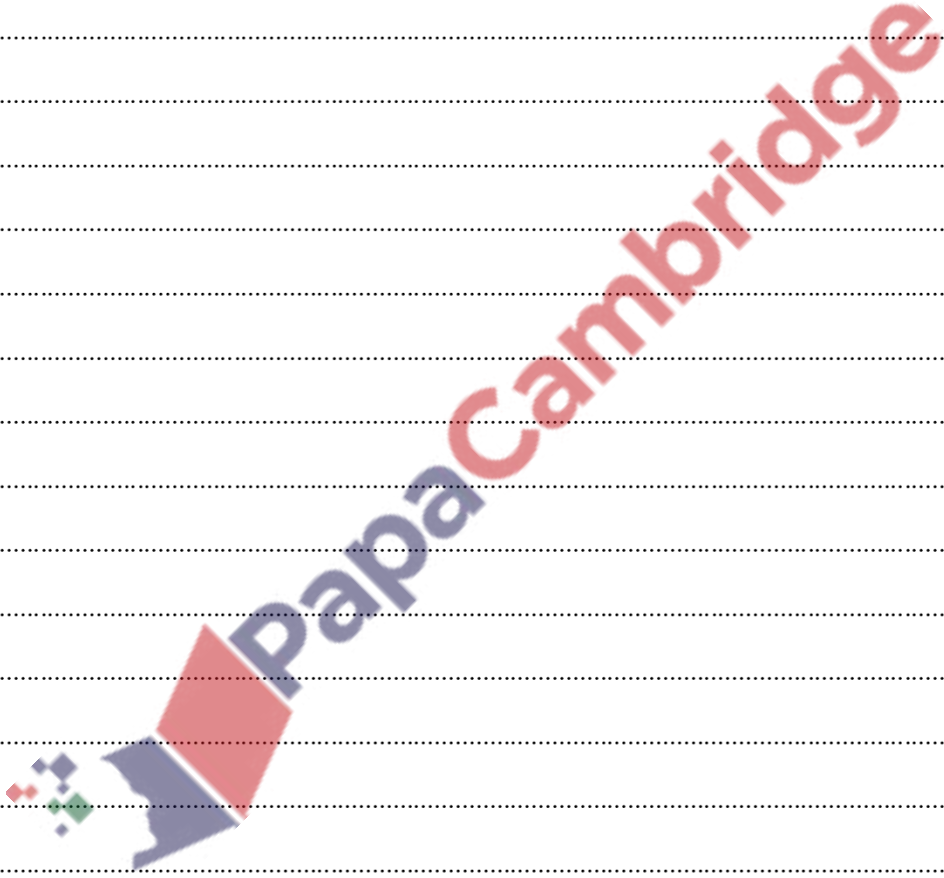
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7. 9709\_m19\_qp\_32 Q: 8

$$\text{Let } f(x) = \frac{12 + 12x - 4x^2}{(2+x)(3-2x)}.$$

- (i) Express  $f(x)$  in partial fractions. [5]

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

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9. 9709\_s19\_qp\_32 Q: 1

Find the coefficient of  $x^3$  in the expansion of  $(3 - x)(1 + 3x)^{\frac{1}{3}}$  in ascending powers of  $x$ . [4]

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14. 9709\_w19\_qp\_33 Q: 2

The polynomial  $6x^3 + ax^2 + bx - 2$ , where  $a$  and  $b$  are constants, is denoted by  $p(x)$ . It is given that  $(2x + 1)$  is a factor of  $p(x)$  and that when  $p(x)$  is divided by  $(x + 2)$  the remainder is  $-24$ . Find the values of  $a$  and  $b$ . [5]

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15. 9709\_m18\_qp\_32 Q: 2

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

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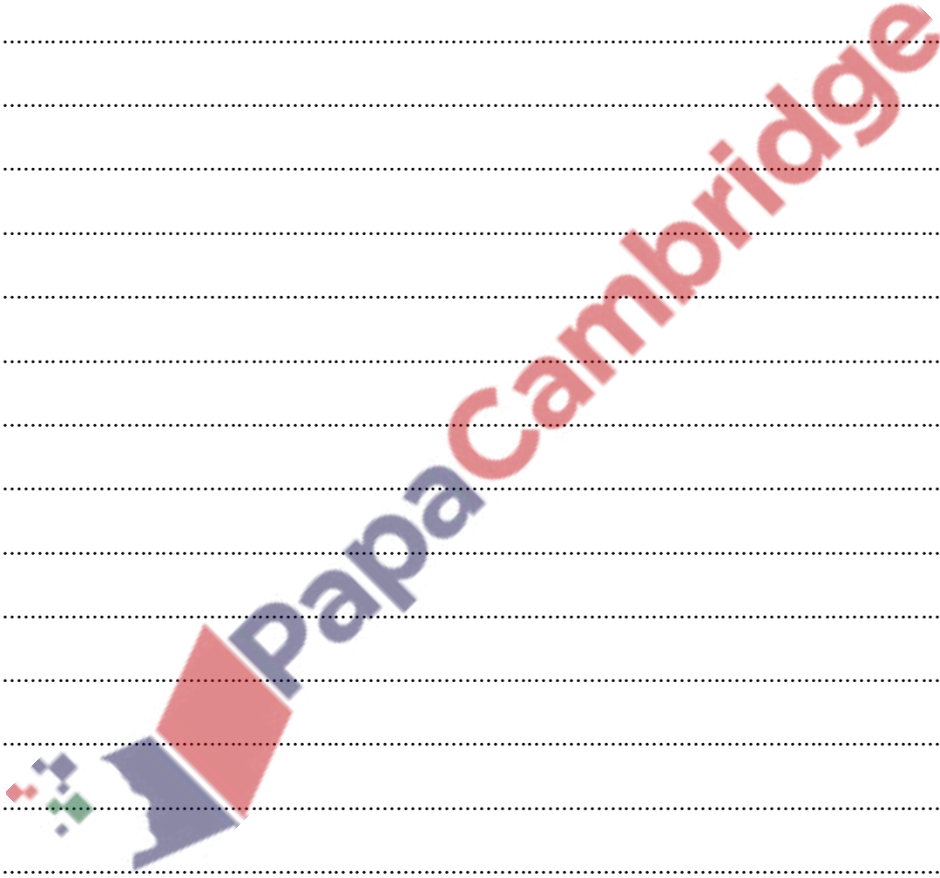
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- (ii) Hence obtain the expansion of  $f(x)$  in ascending powers of  $x$ , up to and including the term in  $x^2$ . [5]

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- (ii) Hence obtain the expansion of  $f(x)$  in ascending powers of  $x$ , up to and including the term in  $x^3$ .  
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21. 9709\_w18\_qp\_32 Q: 1

Solve the inequality  $3|2x - 1| > |x + 4|$ .

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22. 9709\_w18\_qp\_32 Q: 8

Let  $f(x) = \frac{7x^2 - 15x + 8}{(1 - 2x)(2 - x)^2}$ .

(i) Express  $f(x)$  in partial fractions.

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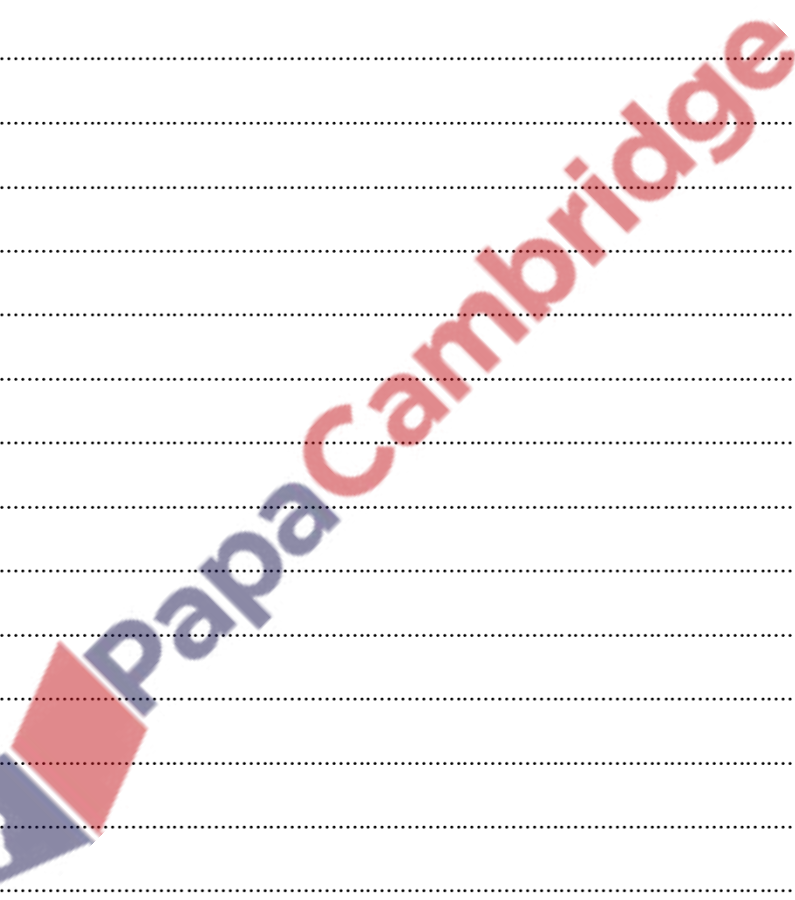
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24. 9709\_m17\_qp\_32 Q: 9

Let  $f(x) = \frac{x(6-x)}{(2+x)(4+x^2)}$ .

**(i)** Express  $f(x)$  in partial fractions.

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

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25. 9709\_s17\_qp\_31 Q: 1

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

[4]

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32. 9709\_m16\_qp\_32 Q: 4

The polynomial  $4x^3 + ax + 2$ , where  $a$  is a constant, is denoted by  $p(x)$ . It is given that  $(2x + 1)$  is a factor of  $p(x)$ .

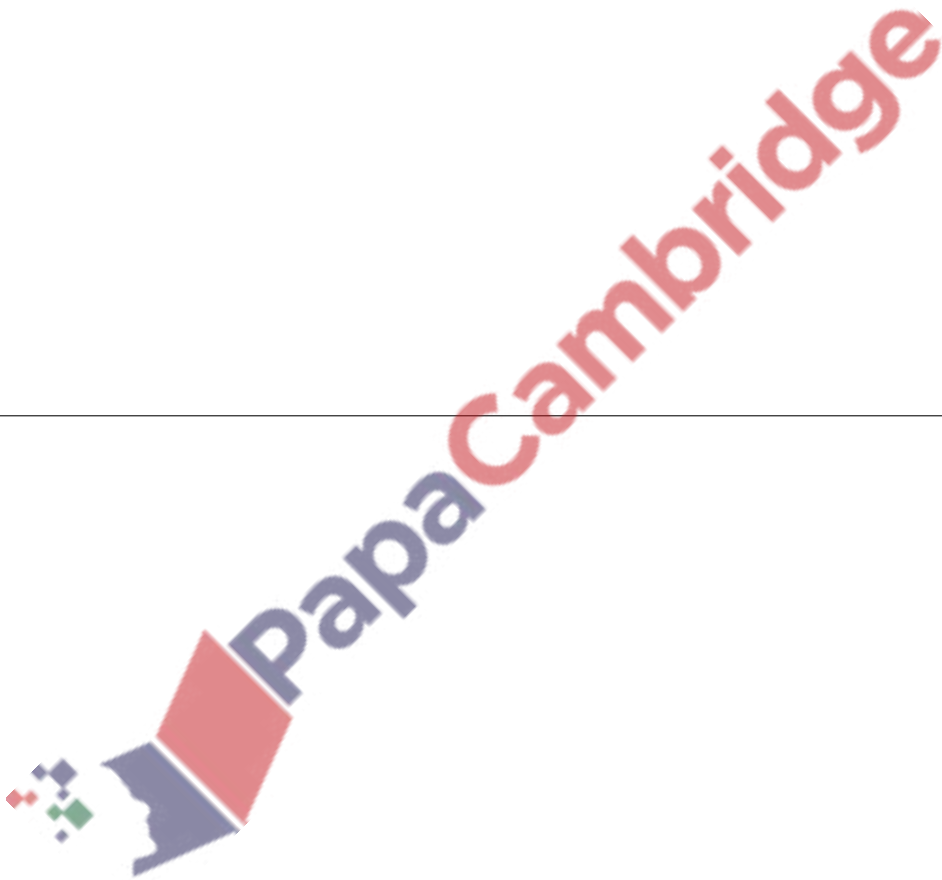
(i) Find the value of  $a$ . [2]

(ii) When  $a$  has this value,

(a) factorise  $p(x)$ , [2]

(b) solve the inequality  $p(x) > 0$ , justifying your answer. [3]

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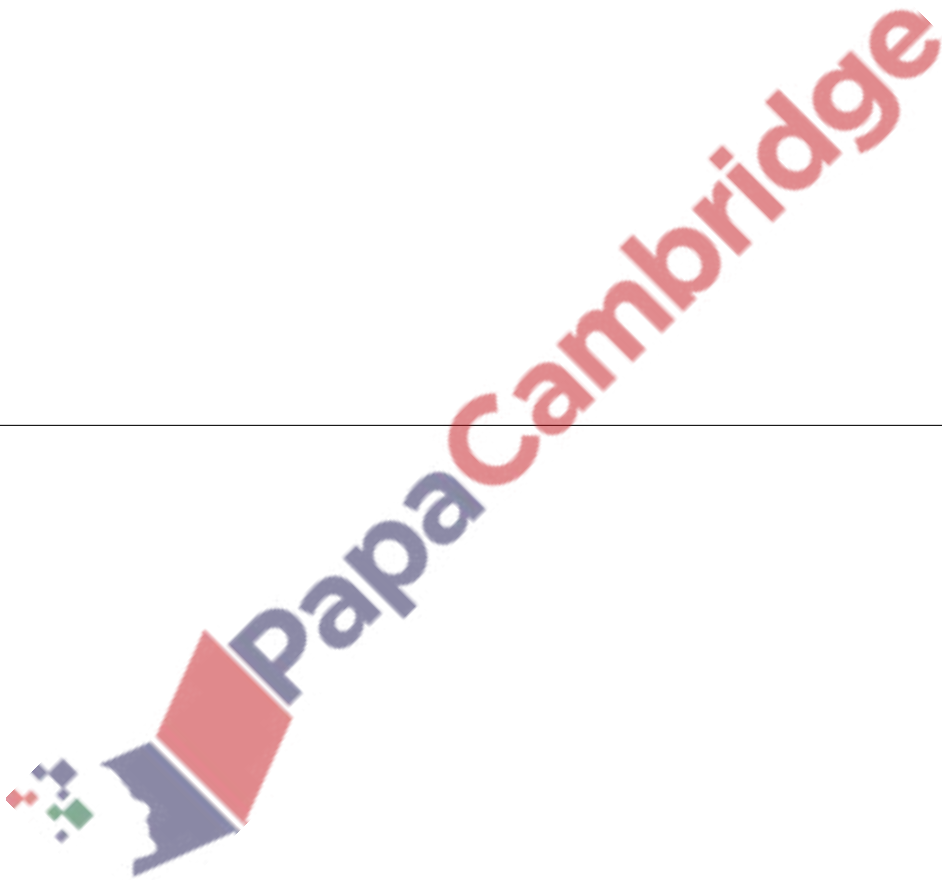


33. 9709\_s16\_qp\_31 Q: 1

(i) Solve the equation  $2|x - 1| = 3|x|$ . [3]

(ii) Hence solve the equation  $2|5^x - 1| = 3|5^x|$ , giving your answer correct to 3 significant figures. [2]

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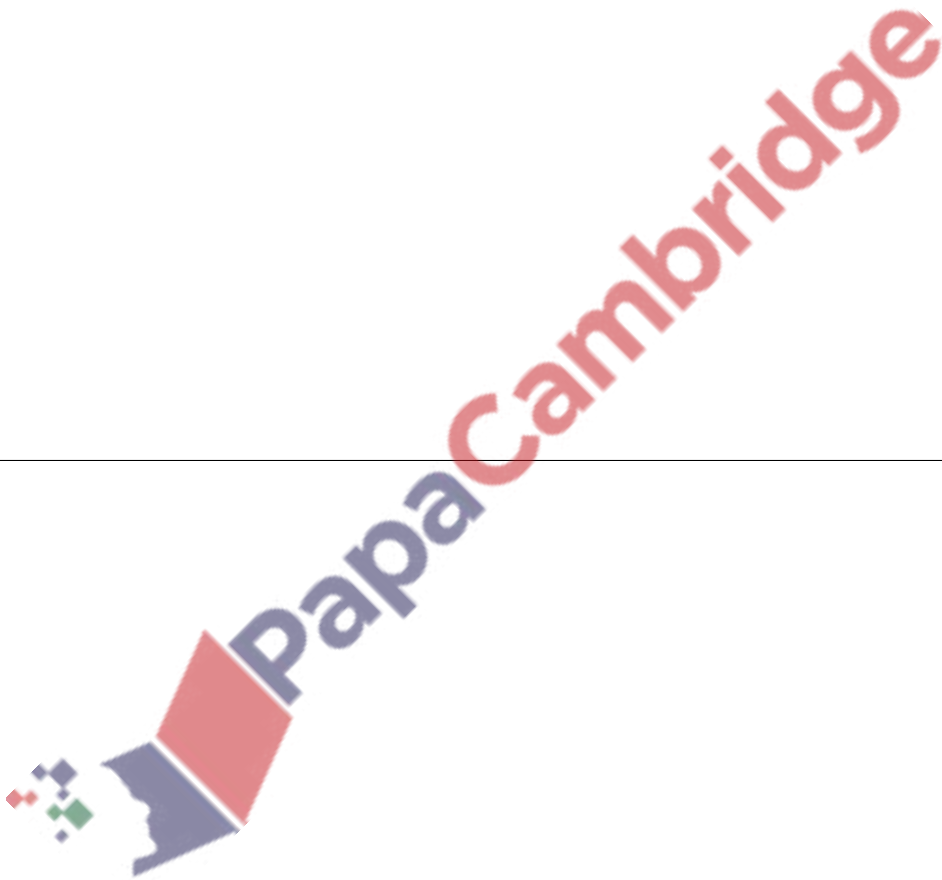
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34. 9709\_s16\_qp\_31 Q: 8

$$\text{Let } f(x) = \frac{4x^2 + 12}{(x + 1)(x - 3)^2}.$$

- (i) Express  $f(x)$  in partial fractions. [5]
- (ii) Hence obtain the expansion of  $f(x)$  in ascending powers of  $x$ , up to and including the term in  $x^2$ . [5]

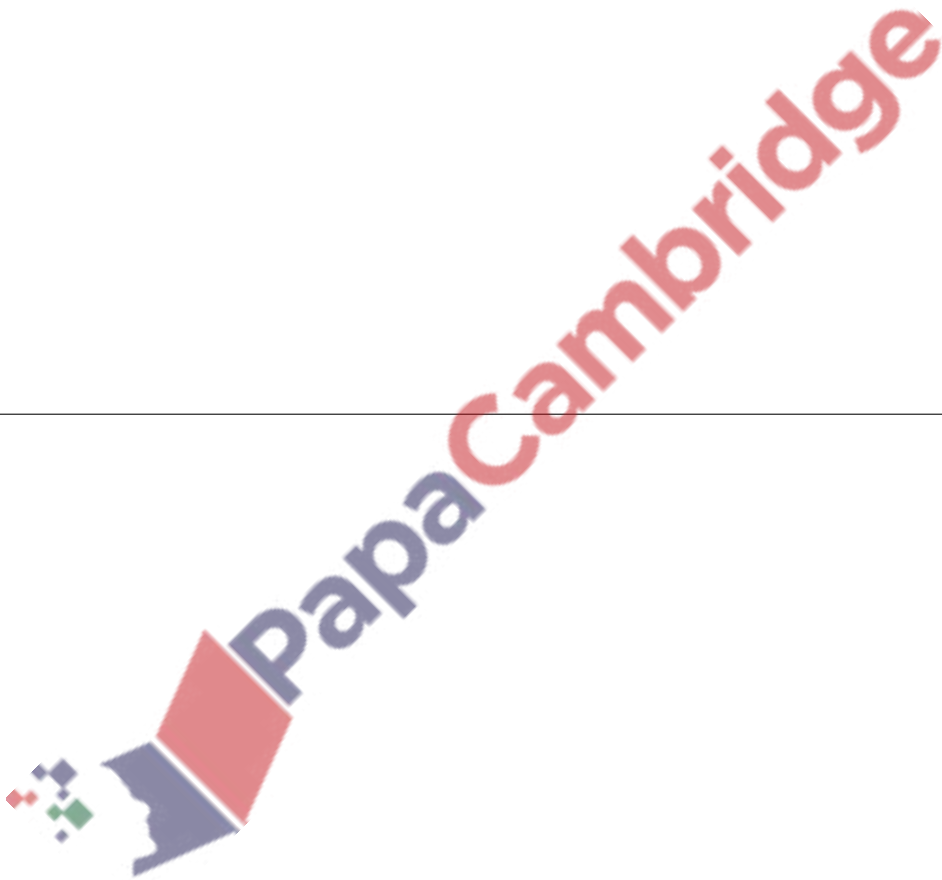
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35. 9709\_s16\_qp\_32 Q: 2

Expand  $\frac{1}{\sqrt{1-2x}}$  in ascending powers of  $x$ , up to and including the term in  $x^3$ , simplifying the coefficients. [4]

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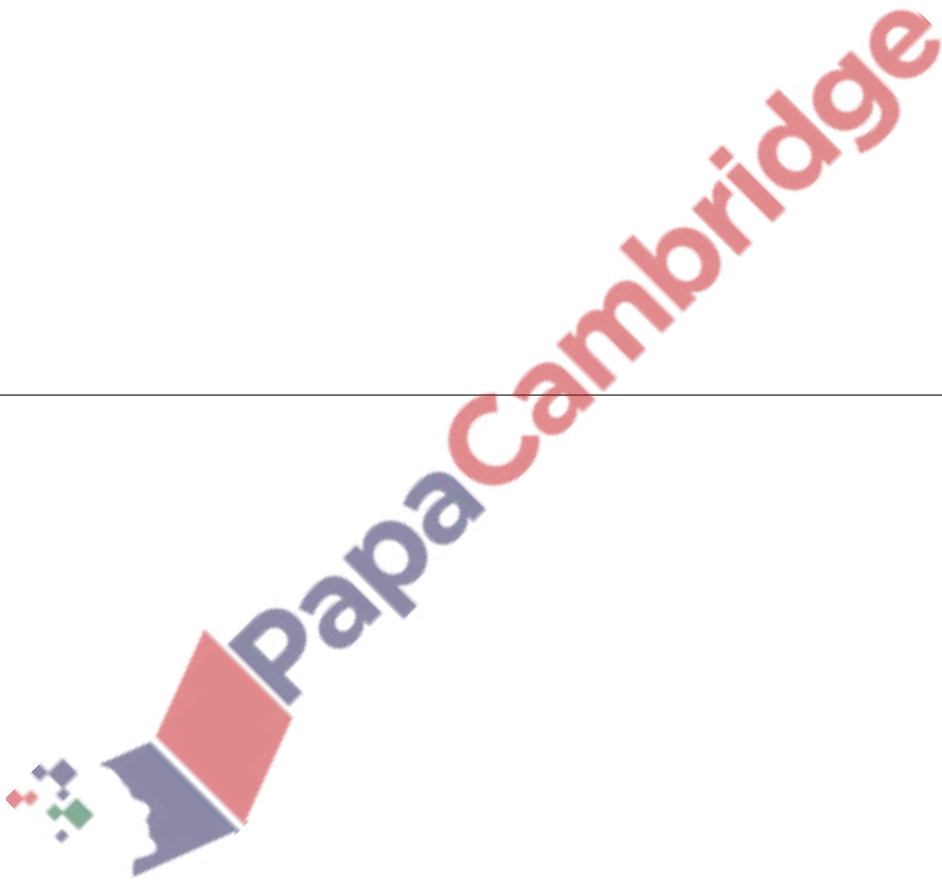
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36. 9709\_s16\_qp\_33 Q: 1

Solve the inequality  $2|x - 2| > |3x + 1|$ .

[4]

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37. 9709\_s16\_qp\_33 Q: 10

$$\text{Let } f(x) = \frac{10x - 2x^2}{(x + 3)(x - 1)^2}.$$

- (i) Express  $f(x)$  in partial fractions. [5]
- (ii) Hence obtain the expansion of  $f(x)$  in ascending powers of  $x$ , up to and including the term in  $x^2$ . [5]

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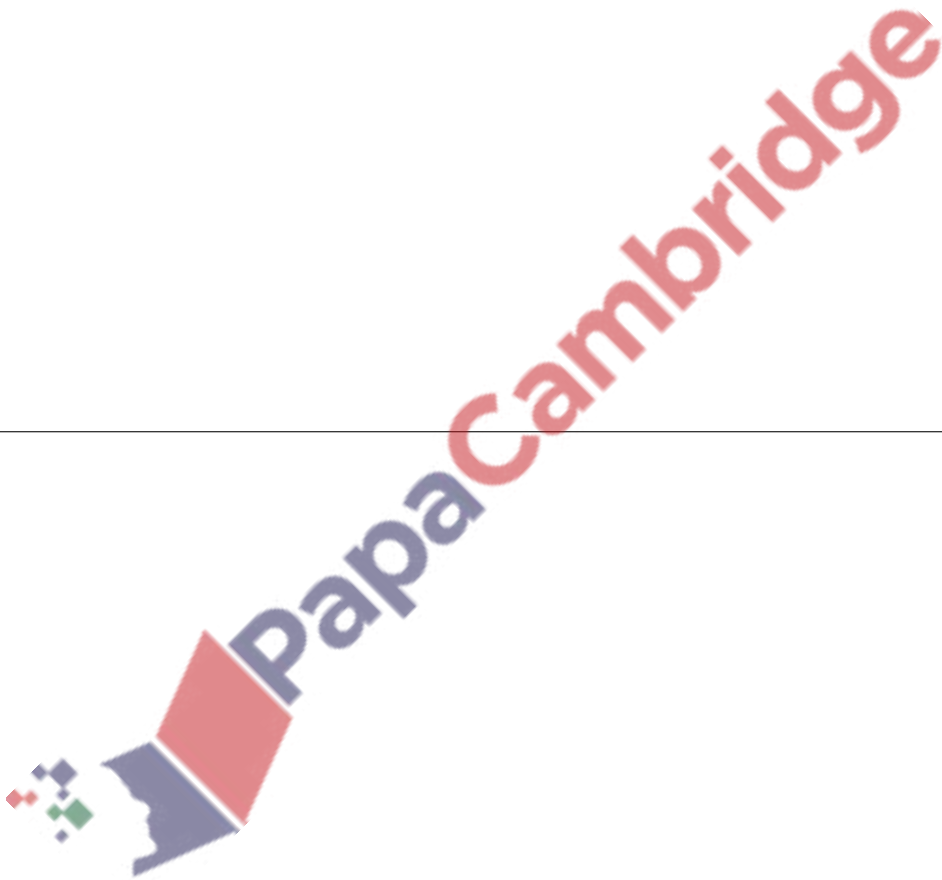
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38. 9709\_w16\_qp\_31 Q: 2

Expand  $(2 - x)(1 + 2x)^{-\frac{3}{2}}$  in ascending powers of  $x$ , up to and including the term in  $x^2$ , simplifying the coefficients. [4]

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39. 9709\_w16\_qp\_33 Q: 4

The polynomial  $4x^4 + ax^2 + 11x + b$ , where  $a$  and  $b$  are constants, is denoted by  $p(x)$ . It is given that  $p(x)$  is divisible by  $x^2 - x + 2$ .

(i) Find the values of  $a$  and  $b$ . [5]

(ii) When  $a$  and  $b$  have these values, find the real roots of the equation  $p(x) = 0$ . [2]

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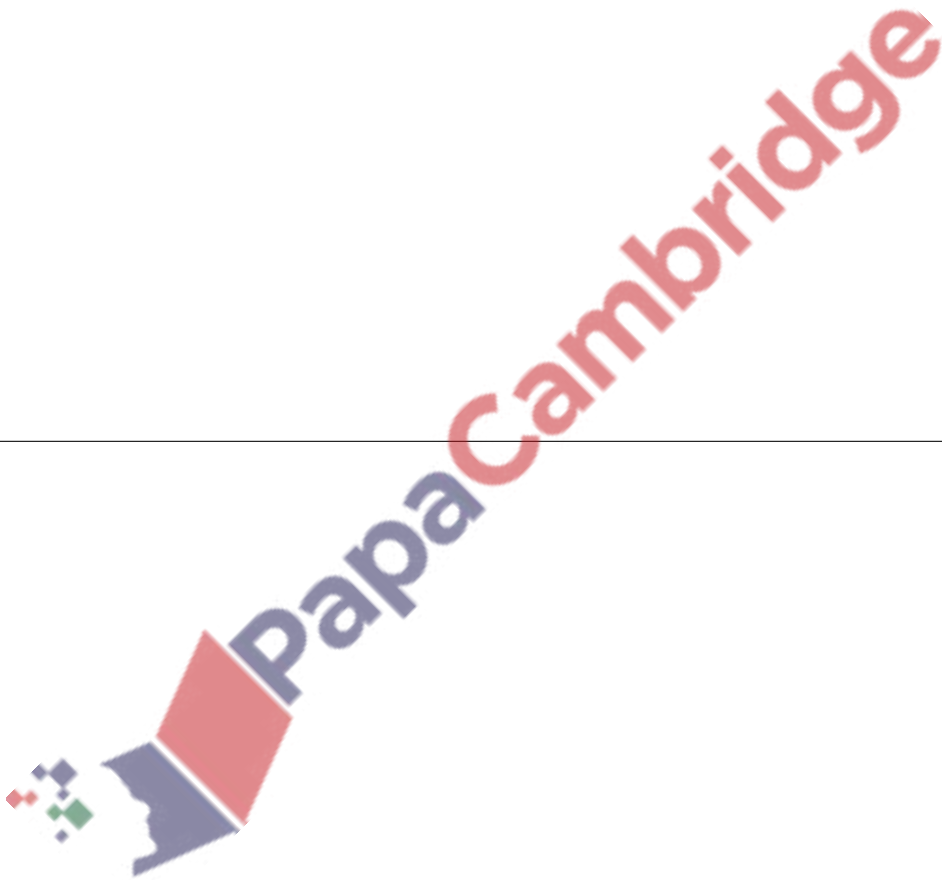
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40. 9709\_w16\_qp\_33 Q: 8

$$\text{Let } f(x) = \frac{3x^2 + x + 6}{(x + 2)(x^2 + 4)}.$$

- (i) Express  $f(x)$  in partial fractions. [5]
- (ii) Hence obtain the expansion of  $f(x)$  in ascending powers of  $x$ , up to and including the term in  $x^2$ . [5]

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41. 9709\_s15\_qp\_31 Q: 3

Show that, for small values of  $x^2$ ,

$$(1 - 2x^2)^{-2} - (1 + 6x^2)^{\frac{2}{3}} \approx kx^4,$$

where the value of the constant  $k$  is to be determined.

[6]

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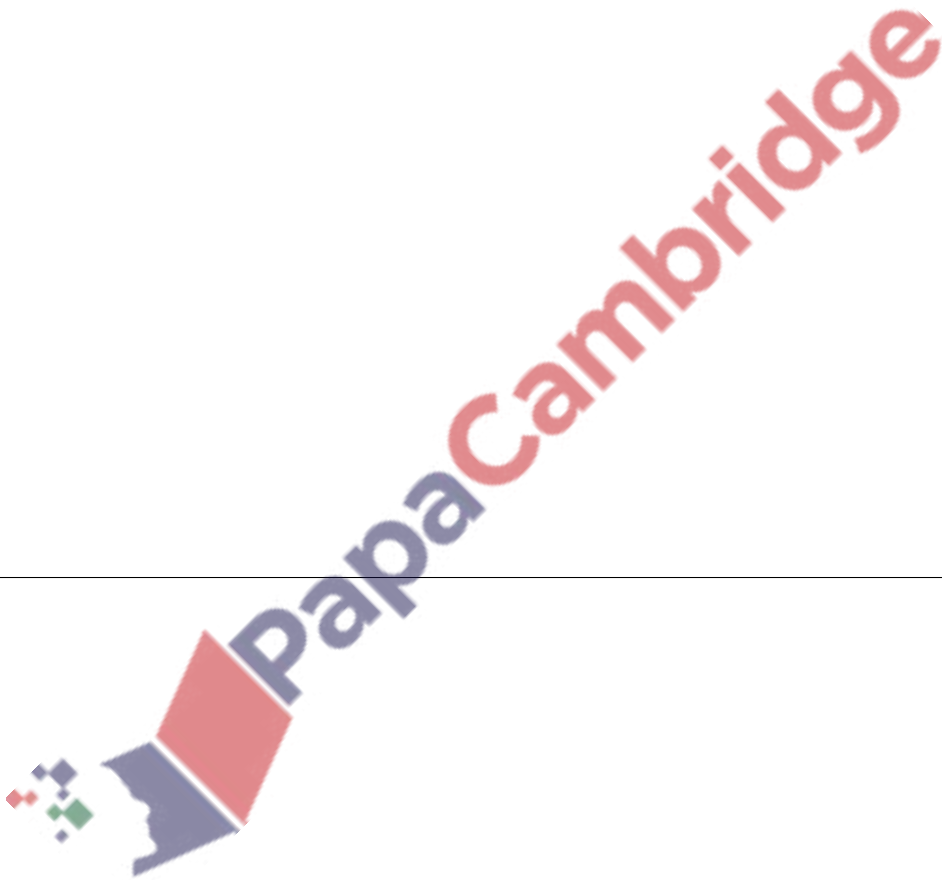
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42. 9709\_s15\_qp\_32 Q: 8

$$\text{Let } f(x) = \frac{5x^2 + x + 6}{(3 - 2x)(x^2 + 4)}.$$

- (i) Express  $f(x)$  in partial fractions. [5]
- (ii) Hence obtain the expansion of  $f(x)$  in ascending powers of  $x$ , up to and including the term in  $x^2$ . [5]

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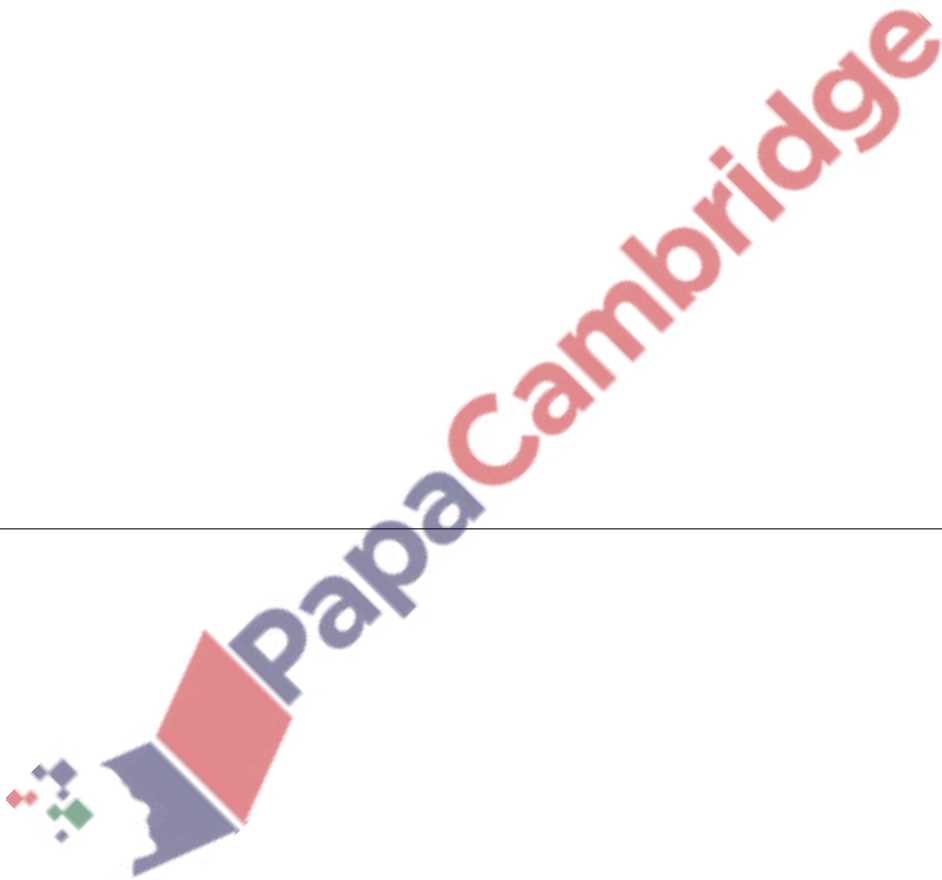


43. 9709\_s15\_qp\_33 Q: 2

Solve the inequality  $|x - 2| > 2x - 3$ .

[4]

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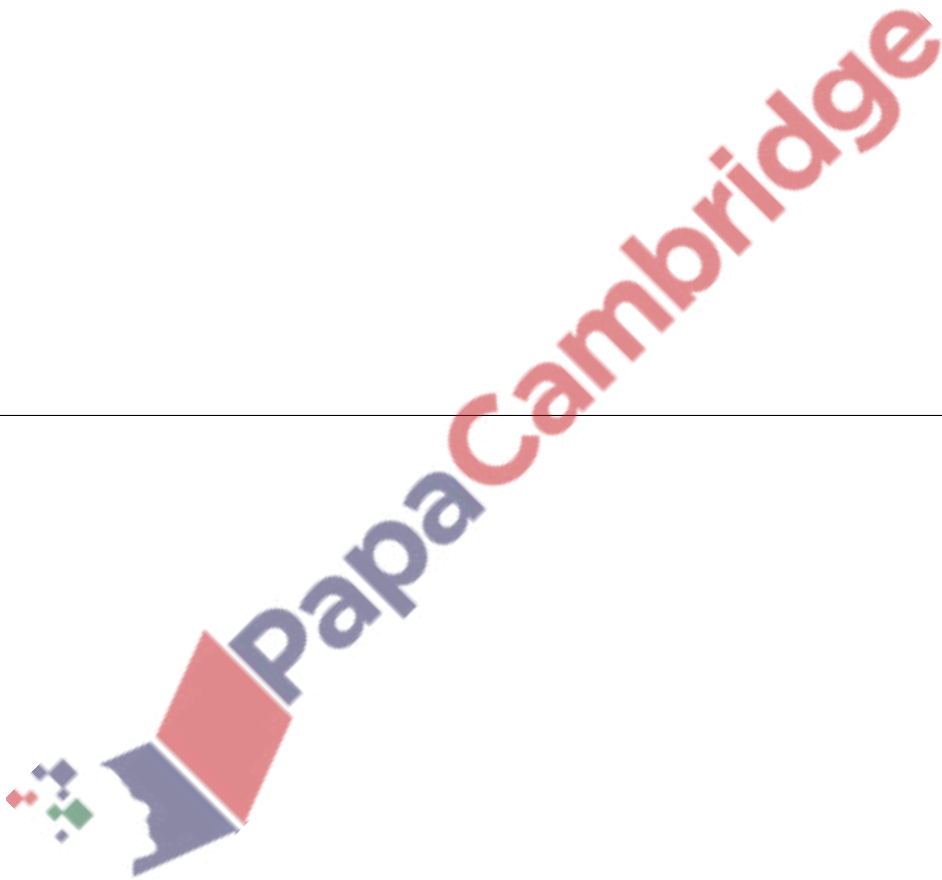
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44. 9709\_w15\_qp\_31 Q: 1

Solve the inequality  $|2x - 5| > 3|2x + 1|$ .

[4]

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45. 9709\_w15\_qp\_31 Q: 6

The polynomial  $8x^3 + ax^2 + bx - 1$ , where  $a$  and  $b$  are constants, is denoted by  $p(x)$ . It is given that  $(x + 1)$  is a factor of  $p(x)$  and that when  $p(x)$  is divided by  $(2x + 1)$  the remainder is 1.

(i) Find the values of  $a$  and  $b$ . [5]

(ii) When  $a$  and  $b$  have these values, factorise  $p(x)$  completely. [3]

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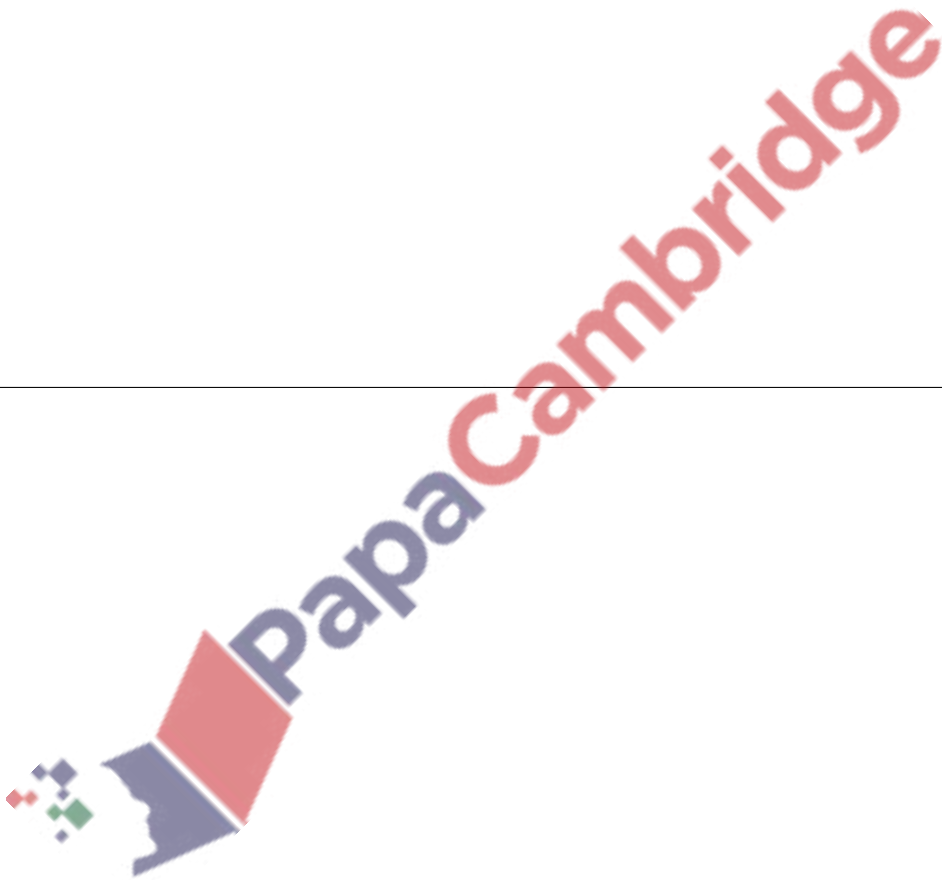
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46. 9709\_w15\_qp\_33 Q: 2

Given that  $\sqrt[3]{(1+9x)} \approx 1 + 3x + ax^2 + bx^3$  for small values of  $x$ , find the values of the coefficients  $a$  and  $b$ . [3]

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