

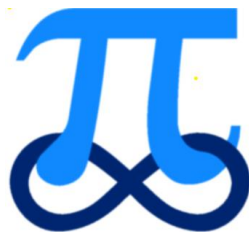
# Edexcel

## Pure Mathematics

### Year 2

## Algebraic Methods

*Past paper questions from  
Core Maths 3, Core Maths 4 and IAL C34*



Edited by: K V Kumaran

1. Express

$$\frac{2x^2 + 3x}{(2x + 3)(x - 2)} - \frac{6}{x^2 - x - 2}$$

as a single fraction in its simplest form.

(7)

(C3, Q2Jan 2006)

2. (a) Simplify  $\frac{3x^2 - x - 2}{x^2 - 1}$ .

(3)

(b) Hence, or otherwise, express  $\frac{3x^2 - x - 2}{x^2 - 1} - \frac{1}{x(x + 1)}$  as a single fraction in its simplest form.

(3)

(C3, Q1 June 2006)

3. Given that

$$\frac{2x^4 - 3x^2 + x + 1}{(x^2 - 1)} \equiv (ax^2 + bx + c) + \frac{dx + e}{(x^2 - 1)},$$

find the values of the constants  $a, b, c, d$  and  $e$ .

(4)

(C3, Q1 Jan 2008)

4. The function  $f$  is defined by

$$f: x \mapsto \frac{2(x-1)}{x^2 - 2x - 3} - \frac{1}{x-3}, \quad x > 3.$$

(a) Show that  $f(x) = \frac{1}{x+1}$ ,  $x > 3$ .

(4)

(C3, Q4 June 2008)

5.

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

(a) Express  $f(x)$  as a single fraction in its simplest form.

(4)

(C3, Q2 Jan 2009)

6. The function  $f$  is defined by

$$f(x) = 1 - \frac{2}{(x+4)} + \frac{x-8}{(x-2)(x+4)}, \quad x \in \mathbb{R}, \quad x \neq -4, \quad x \neq 2.$$

(a) Show that  $f(x) = \frac{x-3}{x-2}$ .

(5)  
(C3, Q7 June 2009)

7. Express

$$\frac{x+1}{3x^2-3} - \frac{1}{3x+1}$$

as a single fraction in its simplest form.

(4)  
(C3, Q1 Jan 2010)

8. (a) Simplify fully

$$\frac{2x^2 + 9x - 5}{x^2 + 2x - 15}$$

(3)  
(C3 Q8 June 2010)

9. (a) Express

$$\frac{4x-1}{2(x-1)} - \frac{3}{2(x-1)(2x-1)}$$

as a single fraction in its simplest form.

(4)

Given that

$$f(x) = \frac{4x-1}{2(x-1)} - \frac{3}{2(x-1)(2x-1)} - 2, \quad x > 1,$$

(b) show that

$$f(x) = \frac{3}{2x-1}$$

(2)  
(C3, Q2 Jan 2011)

10. 
$$f(x) = \frac{4x-5}{(2x+1)(x-3)} - \frac{2x}{x^2-9}, \quad x \neq \pm 3, x \neq -\frac{1}{2}.$$

(a) Show that

$$f(x) = \frac{5}{(2x+1)(x-3)}.$$

(5)  
(C3, Q7 June 2011)

11. The function  $f$  is defined by

$$f : x \mapsto \frac{3(x+1)}{2x^2+7x-4} - \frac{1}{x+4}, \quad x \in \mathbb{R}, x > \frac{1}{2}.$$

(a) Show that  $f(x) = \frac{1}{2x-1}$ .

(4)  
(C3, Q7 Jan 2012)

12. Express

$$\frac{2(3x+2)}{9x^2-4} - \frac{2}{3x+1}$$

as a single fraction in its simplest form.

(4)  
(C3, Q1 June 2012)

13. 
$$h(x) = \frac{2}{x+2} + \frac{4}{x^2+5} - \frac{18}{(x^2+5)(x+2)}, \quad x \geq 0.$$

(a) Show that  $h(x) = \frac{2x}{x^2+5}$ .

(4)  
(C3, Q7 Jan 2013)

14. Given that

$$\frac{3x^4 - 2x^3 - 5x^2 - 4}{x^2 - 4} \equiv ax^2 + bx + c + \frac{dx + e}{x^2 - 4}, \quad x \neq \pm 2$$

find the values of the constants  $a, b, c, d$  and  $e$ .

(4)  
(C3, Q1 June 2013)

15. Express

$$\frac{3x+5}{x^2+x-12} - \frac{2}{x-3}$$

as a single fraction in its simplest form.

(4)

(C3, Q1 June 2013\_R)

16.

$$g(x) = \frac{x}{x+3} + \frac{3(2x+1)}{x^2+x-6}, \quad x > 3$$

(a) Show that  $g(x) = \frac{x+1}{x-2}$ ,  $x > 3$

(4)

(C3, Q5 June 2014)

17. Express

$$\frac{3}{2x+3} - \frac{1}{2x-3} + \frac{6}{4x^2-9}$$

as a single fraction in its simplest form.

(4)

(C3, Q1 June 2014\_R)

18.

$$f(x) = \frac{15}{3x+4} - \frac{2x}{x-1} + \frac{14}{(3x+4)(x-1)}, \quad x > 1$$

(a) Express  $f(x)$  as a single fraction in its simplest form.

(4)

(C3, Q2 Jan 2014\_R\*)

19. Given that

$$4x^3 + 2x^2 + 17x + 8 \equiv (Ax + B)(x^2 + 4) + Cx + D$$

(a) find the values of the constants  $A$ ,  $B$ ,  $C$  and  $D$ .

(4)

(C34, Q3 Jan 2014\_IAL)

20. Given that  $k$  is a **negative** constant and that the function  $f(x)$  is defined by

$$f(x) = 2 - \frac{(x-5k)(x-k)}{x^2 - 3kx + 2k^2}, \quad x \geq 0,$$

(a) show that  $f(x) = \frac{x+k}{x-2k}$ .

(3)

(C3, Q9 June 2015)

21.

$$f(x) = \frac{x^4 + x^3 - 3x^2 + 7x - 6}{x^2 + x - 6}, \quad x > 2, \quad x \in \mathbb{R}.$$

(a) Given that

$$\frac{x^4 + x^3 - 3x^2 + 7x - 6}{x^2 + x - 6} \equiv x^2 + A + \frac{B}{x-2},$$

find the values of the constants  $A$  and  $B$ .

(4)

(C3, Q6 June 2016\*)

22. Express  $\frac{4x}{x^2 - 9} - \frac{2}{x+3}$  as a single fraction in its simplest form.

(C3, Q1 June 2017)

23. The function  $f$  is defined by

$$f(x) = \frac{6}{2x+5} + \frac{2}{2x-5} + \frac{60}{4x^2 - 25}, \quad x > 4$$

Show that  $f(x) = \frac{A}{Bx+C}$  where  $A$ ,  $B$  and  $C$  are constants to be found.

(4)

(C3, Q2 June 2018\*)

24. Given that

$$\frac{4x^3 - 6x^2 - 18x + 20}{x^2 - 4} \equiv ax + b + \frac{c}{x-2} \quad x \neq \pm 2$$

find the values of the constants  $a$ ,  $b$  and  $c$ .

(4)

(C3, Q1 June 2019)

25.

Given that

$$\frac{x^4 + x^3 - 7x^2 + 8x - 48}{x^2 + x - 12} \equiv x^2 + A + \frac{B}{x-3}$$

find the values of the constants  $A$  and  $B$ .

(4)

(C34, Q3 June 2016\_IAL)

26. (a) Express  $\frac{5x+3}{(2x-3)(x+2)}$  in partial fractions.

(3)

(C4 June 2005 Q3)

27.  $f(x) = \frac{3x^2 + 16}{(1-3x)(2+x)^2} = \frac{A}{1-3x} + \frac{B}{2+x} + \frac{C}{(2+x)^2}$ ,  $|x| < \frac{1}{3}$ .

(a) Find the values of  $A$  and  $C$  and show that  $B = 0$ .

(4)

(C4 Jan 2006 Q5)

28.  $f(x) = \frac{3x-1}{(1-2x)^2}$ ,  $|x| < \frac{1}{2}$ .

Given that, for  $x \neq \frac{1}{2}$ ,  $\frac{3x-1}{(1-2x)^2} = \frac{A}{1-2x} + \frac{B}{(1-2x)^2}$ , where  $A$  and  $B$  are constants,

(a) find the values of  $A$  and  $B$ .

(3)

(C4 June 2006 Q2)

29.  $\frac{2(4x^2 + 1)}{(2x+1)(2x-1)} \equiv A + \frac{B}{2x+1} + \frac{C}{2x-1}$ .

(a) Find the values of the constants  $A$ ,  $B$  and  $C$ .

(4)

(C4 June 2007 Q4)

30.  $f(x) = \frac{27x^2 + 32x + 16}{(3x+2)^2(1-x)}$ ,  $|x| < \frac{2}{3}$ .

Given that  $f(x)$  can be expressed in the form

$$f(x) = \frac{A}{3x+2} + \frac{B}{(3x+2)^2} + \frac{C}{1-x},$$

find the values of  $B$  and  $C$  and show that  $A = 0$ .

(4)

(C4 Jan 2009 Q3)

31. 
$$f(x) = \frac{4-2x}{(2x+1)(x+1)(x+3)} = \frac{A}{(2x+1)} + \frac{B}{(x+1)} + \frac{C}{(x+3)} .$$

(a) Find the values of the constants  $A$ ,  $B$  and  $C$ .

(4)

(C4 June 2009 Q3)

32. 
$$\frac{2x^2 + 5x - 10}{(x-1)(x+2)} \equiv A + \frac{B}{x-1} + \frac{C}{x+2} .$$

(a) Find the values of the constants  $A$ ,  $B$  and  $C$ .

(4)

(C4 June 2010 Q5)

33. (a) Express  $\frac{5}{(x-1)(3x+2)}$  in partial fractions.

(3)

(C4 Jan 2011 Q3)

34. 
$$\frac{9x^2}{(x-1)^2(2x+1)} = \frac{A}{(x-1)} + \frac{B}{(x-1)^2} + \frac{C}{(2x+1)} .$$

Find the values of the constants  $A$ ,  $B$  and  $C$ .

(4)

(C4 June 2011 Q1)

35. (a) Express  $\frac{1}{P(5-P)}$  in partial fractions.

(3)

(C4 Jan 2012 Q8)

36. 
$$f(x) = \frac{1}{x(3x-1)^2} = \frac{A}{x} + \frac{B}{(3x-1)} + \frac{C}{(3x-1)^2} .$$

(a) Find the values of the constants  $A$ ,  $B$  and  $C$ .

(4)

(C4 June 2012 Q1)

37. Express  $\frac{9x^2 + 20x - 10}{(x+2)(3x-1)}$  in partial fractions.



(4)  
(C4 Jan 2013 Q3)

38. Express in partial fractions

$$\frac{5x+3}{(2x+1)(x+1)^2}$$

(4)  
(C4 June 2013\_R Q1)

39. (a) Express  $\frac{25}{x^2(2x+1)}$  in partial fractions.

(4)  
(C4 June 2014\_R Q4)

40. (a) Express  $\frac{2}{P(P-2)}$  in partial fractions.

(3)  
(C4 June 2015 Q7)

41. (a) Express  $\frac{5-4x}{(2x-1)(x+1)}$  in partial fractions.

(3)  
(IAL, C34 June 2014 Q6)

42. Given that

$$\frac{4(x^2+6)}{(1-2x)(2+x)^2} \equiv \frac{A}{1-2x} + \frac{B}{2+x} + \frac{C}{(2+x)^2}$$

(a) find the values of the constants  $A$  and  $C$  and show that  $B = 0$ .

(4)  
(IAL, C34 June 2015 Q2)

43. (a) Express  $\frac{3x^2-4}{x^2(3x-2)}$  in partial fractions.

(4)  
(IAL, C34 Jan 2016 Q9)

44. (a) Express  $\frac{9+11x}{(1-x)(3+2x)}$  in partial fractions.

(3)  
(IAL, C34 Jan 2017 Q3)

45. 
$$\frac{6 - 5x - 4x^2}{(2 - x)(1 + 2x)} = A + \frac{B}{(2 - x)} + \frac{C}{(1 + 2x)}$$

(a) Find the values of the constants  $A$ ,  $B$  and  $C$ .

(4)

(IAL, C34 June 2017 Q5)

46. (a) Express  $\frac{9(4 + x)}{16 - 9x^2}$  in partial fractions.

(3)

(IAL, C34 Jan 2018 Q3)