

ADVANCED HIGHER MATHEMATICS

**Exam Questions on Partial Fractions**

1. Express  $\frac{3x+32}{(x+4)(6-x)}$  in partial fractions.
2. Express  $\frac{5x-4}{x^2-4x}$  in partial fractions.
3. Express  $\frac{3x-7}{x^2-2x-15}$  in partial fractions.
4. Express  $\frac{11-2x}{x^2+x-2}$  in partial fractions.
5. Find partial fractions for  $\frac{4}{x^2-4}$ .
6. Obtain partial fractions for  $\frac{x}{x^2-1}$ .
7. Express  $\frac{1}{1-y^2}$  in partial fractions.
8. Express  $\frac{1}{x^2-x-6}$  in partial fractions.
9. Express  $\frac{3x+5}{(x+1)(x+2)(x+3)}$  in partial fractions.
10. Express  $\frac{8}{x(x+2)(x+4)}$  in partial fractions.
11. Find partial fractions for  $\frac{13+6x+5x^2}{(1+x)(2-x)(3+x)}$ .
12. Express  $\frac{2x^2-9x-6}{x(x^2-x-6)}$  in partial fractions.
13. Express  $\frac{x^2-6x+20}{(x+1)(x-2)^2}$  in partial fractions.

14. Express  $\frac{x^2 + 6x - 4}{(x + 2)^2(x - 4)}$  in partial fractions.
15. Express  $\frac{x + 4}{(x + 1)^2(2x - 1)}$  in partial fractions.
16. Express  $\frac{3x^2 + 4x + 17}{(x - 3)(x^2 + 5)}$  as a sum of partial fractions.

17. Express  $\frac{12x^2 + 20}{x(x^2 + 5)}$  in partial fractions.

18. Express  $\frac{x^2 + 3}{x(1 + x^2)}$  in partial fractions.

19. Express  $\frac{1}{x^3 + x}$  in partial fractions.

20. (a) Find a real root of the cubic polynomial

$$c(x) = x^3 - x^2 - x - 2$$

and hence factorise it as the product of a linear term  $l(x)$  and a quadratic term  $q(x)$ .

- (b) Show that  $c(x)$  cannot be written as the product of three linear factors with real coefficients.
- (c) Use your factorisation to find values of  $A$ ,  $B$  and  $C$  such that

$$\frac{5x + 4}{x^3 - x^2 - x - 2} = \frac{A}{l(x)} + \frac{Bx + C}{q(x)}.$$

21. (a) Show that  $\frac{3x^3 + 8x^2 - 11}{(x + 1)(x + 3)(x - 2)}$  can be written as  $3 + \frac{2x^2 + 15x + 7}{x^3 + 2x^2 - 5x - 6}$ .

(b) Hence express  $\frac{3x^3 + 8x^2 - 11}{(x + 1)(x + 3)(x - 2)}$  in partial fractions.