A Level · Edexcel · Maths

3 hours 35 questions

2.11 Partial Fractions (A Level only)

Easy (8 questions)	/36
Medium (9 questions)	/51
Hard (9 questions)	/53
Very Hard (9 questions)	/55
Total Marks	**/195**

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Easy Questions

1 Express

$$\frac{1}{x(x+1)}$$

as partial fractions.

(3 marks)

2 (i) Factorise x^2+5x-6.

(ii) Hence, or otherwise, express

$$\frac{(5x+16)}{x^2+5x-6}$$

as partial fractions.

(4 marks)

3 Express

$$\frac{6x-13}{x^2-5x+6}$$

as partial fractions.

(4 marks)

4 Write

$$\frac{2(x-11)}{x^2+2x-15}$$

in the form

$$\frac{A}{x+5}+\frac{B}{x-3}$$

where A and B are integers to be found.

(3 marks)

5 Show that

$$\frac{3x+8}{(x+1)^2} \equiv \frac{A}{x+1}+\frac{B}{(x+1)^2}$$

where A and B are integers to be found.

(3 marks)

6 Express

$$\frac{5x^2+10x+8}{x(x+2)^2}$$

in partial fractions.

(5 marks)

7 Write

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

in the form

$$\frac{A}{x}+\frac{B}{x-1}+\frac{C}{x-2}$$

where A, B and C are integers to be found.

(5 marks)

8 (a) (i) Briefly explain why

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

is an improper (algebraic) fraction.

(ii) Show that

$$(x^2+x-4)\div(x^2+4x+3)=1-\frac{(3x+7)}{x^2+4x+3}$$

(4 marks)

(b) Express

$$\frac{3x+7}{x^2+4x+3}$$

as partial fractions.

(3 marks)

(c) Hence, show that

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

(2 marks)

Medium Questions

1 Express $\frac{2}{x(x+2)}$ as partial fractions.

(3 marks)

2 Write $\frac{x-10}{(x+2)(x-1)}$ in the form $\frac{A}{x+2}+\frac{B}{x-1}$, where A and B are integers to be found.

(3 marks)

3 (a) It is given that

$$f(x) = x^3 - 13x + 12.$$

(i) Show that $f(1) = 0$.

(ii) Hence write down a factor of $f(x)$.

(3 marks)

(b) (i) Show that $f(3) = 0$.

(ii) Hence write down another factor of $f(x)$.

(3 marks)

(c) Fully factorise $f(x)$.

(2 marks)

(d) Express $\dfrac{3x^2 - 13}{x^3 - 13x + 12}$ as partial fractions.

(4 marks)

4 Express $\frac{7x+34}{x^2+9x+14}$ as partial fractions.

(4 marks)

5 (a) Use algebraic division to work out $(x^2 + 4x - 6) \div (x^2 - x - 6)$.

(2 marks)

(b) Write $\frac{5x}{(x+2)(x-3)}$ in the form $\frac{A}{x+2} + \frac{B}{x-3}$

(3 marks)

(c) Hence, or otherwise, show that $\frac{x^2 + 4x - 6}{x^2 - x - 6} = 1 + \frac{2}{x+2} + \frac{3}{x-3}$

(3 marks)

6 Express $\frac{2x}{(x+1)(x-2)}$ as partial fractions.

(4 marks)

7 (a) Use the factor theorem to show that $(x+1)$ is a factor of x^3-3x^2+4.

(2 marks)

(b) Hence, or otherwise, fully factorise x^3-3x^2+4.

(2 marks)

(c) Show that $\frac{19-8x}{x^3-3x^2+4}$ can be written in the form $\frac{A}{x+1}+\frac{B}{x-2}+\frac{C}{(x-2)^2}$, where A, B and C are integers to be found.

(4 marks)

8 Express $\frac{3x+11}{x^2+6x+9}$ as partial fractions.

(4 marks)

9 Express $\dfrac{x^2-5}{x^3-x^2-17x-15}$ as partial fractions.

(5 marks)

Hard Questions

1 Express $\frac{12}{x^2+4x-5}$ as partial fractions.

(3 marks)

2 Write $\frac{12x-6}{(x-3)(x+2)(x-1)}$ in the form $\frac{A}{x-3}+\frac{B}{x+2}+\frac{C}{x-1}$, where A, B and C are integers to be found.

(4 marks)

3 (a) It is given that

$$f(x) = x^3 + 3x^2 - 4x - 12.$$

(i) Show that $f(-3) = 0$

(ii) Hence write down a factor of $f(x)$.

(3 marks)

(b) Fully factorise $f(x)$.

(4 marks)

(c) Express $\dfrac{3x^2 - 8x - 36}{x^3 + 3x^2 - 4x - 12}$ as partial fractions.

(3 marks)

4 Express $\dfrac{2x^2 + 16x - 24}{x^3 - 2x^2 - 8x}$ as partial fractions.

(4 marks)

5 (a) Show that $\frac{x^2+x+5}{x^2+3x+2}$ can be written in the form $A-\frac{2x-3}{(x+1)(x+2)}$, where A is an integer to be found.

(2 marks)

(b) Express $\frac{2x-3}{(x+1)(x+2)}$ in the form $\frac{B}{x+1}+\frac{C}{x+2}$ where B and C are integers to be found.

(3 marks)

(c) Using your values for A, B and C write $\frac{x^2+x+5}{x^2+3x+2}$ in the form $A+\frac{B}{x+1}+\frac{C}{x+2}$

(3 marks)

6 Express $\frac{2x}{x^2-9x-52}$ as partial fractions.

(5 marks)

7 (a) Use the factor theorem to show that $(x-2)$ is a factor of $x^3+4x^2-3x-18$.

(2 marks)

(b) Hence, or otherwise, fully factorise $x^3+4x^2-3x-18$.

(3 marks)

(c) Show that $\dfrac{7x^2+32x+8}{x^3+4x^2-3x-18}$ can be written in the form $\dfrac{A}{x-2}+\dfrac{B}{x+3}+\dfrac{C}{(x+3)^2}$, where A, B and C are integers to be found.

(4 marks)

8 Express $\dfrac{3x^2-22x+25}{x^3-7x^2+8x+16}$ as partial fractions.

(5 marks)

9 Express $\frac{2x^2-3}{x^3+4x^2-3x-18}$ as partial fractions.

(5 marks)

Very Hard Questions

1 Express $\frac{8}{x^3-6x^2+8x}$ as partial fractions.

(5 marks)

2 Write $\frac{13x^2-10}{x^3-x^2-2x}$ in the form $\frac{A}{x}+\frac{B}{x+1}+\frac{C}{x-2}$, where A, B and C are integers to be found.

(5 marks)

3 Show that $\frac{34-3x^2-x}{x^3-5x^2+3x+9}$ can be written in the form $\frac{A}{x+1}+\frac{B}{x-3}+\frac{C}{(x-3)^2}$, where A, B and C are integers to be found.

(5 marks)

4 Express $\frac{x^2-3}{(x-3)(x+2)^2}$ as partial fractions.

(4 marks)

5 Write $\frac{x^2+3x+10}{x^2+8x+15}$ in the form $A+\frac{B}{x+3}+\frac{C}{x+5}$, where A, B and C are integers to be found.

(4 marks)

6 (a) It is given that

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

(i) Show that $\mathrm{f}(-3) = 0$.

(ii) Hence, fully factorise $\mathrm{f}(x)$.

(6 marks)

(b) Express $\dfrac{3x^2 - 8x - 36}{\mathrm{f}(x)}$ as partial fractions.

(4 marks)

7 Express $\dfrac{2x - 5}{x^3 - 3x^2 - 13x + 15}$ as partial fractions.

(10 marks)

8 Express $\dfrac{2(3x^3+x^2-17x+4)}{x(x-1)(x-4)(x+2)}$ as partial fractions.

(5 marks)

9 Given that $x^4-4x^3-2x^2+12x+9=(x^2-6x+9)(x^2+2x+1)$, express $\dfrac{5x^3-15x^2+19x+7}{x^4-4x^3-2x^2+12x+9}$ as partial fractions.

(7 marks)