

Partial Fractions Exam Questions MS (From Legacy OCR C4)

Q1 (Jun 2005, Q8) [Modified]

<p>(i) $3x+4 \equiv A(2+x)^2+B(2+x)(1+x) + C(1+x)$ $A = 1$ $C = 2$ $A+B=0$ or $4A+3B+C=3$ or $4A+2B+C = 4$ $B = -1$</p>	<p>M1 A/B1 A/B1 A1 A1 5 B1</p>	<p>Accept \equiv or $=$ If identity used, award 'A' mark, if cover-up rule used, award 'B' mark. <u>Any</u> correct eqn for B from identity</p>
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Q2 (Jan 2006, Q7) [Modified]

<p>(i) $A = 3$ $C = 1$ $11 + 8x \equiv A(1+x)^2 + B(2-x)(1+x) + C(2-x)$ e.g. $A - B = 0, 2A + B - C = 8, A + 2B + 2C = 11$ $B = 3$</p>	<p>B1 B1 M1 A1 A1 5</p>	<p>For correct value stated For correct value stated AEF; any suitable identity For any correct (f.t.) equation involving B</p>
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Q3 (Jun 2007, Q1) [Modified]

<p>(i) Correct format $\frac{A}{x+2} + \frac{B}{x-3}$ $A = 1$ and $B = 2$</p>	<table border="1" style="border-collapse: collapse; width: 100%;"> <tr> <td style="padding: 5px;">M1</td> <td rowspan="2" style="padding: 5px; vertical-align: middle;">s.o.i. in answer</td> </tr> <tr> <td style="padding: 5px;">A1 2</td> </tr> </table>	M1	s.o.i. in answer	A1 2	<p>for both</p>
M1	s.o.i. in answer				
A1 2					

Q4 (Jan 2008, Q1)

<p>(i) Correct format $\frac{A}{x+1} + \frac{B}{x+2}$ $-\frac{1}{x+1}$ or $A = -1$ $+\frac{2}{x+2}$ or $B = 2$</p>	<p>M1 A1 A1 3</p>	<p>stated or implied by answer</p>
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Q5 (Jun 2010, Q3)

<p>$\frac{A}{x-1} + \frac{B}{(x-1)^2} + \frac{C}{x-2}$</p>	<p>M1 For correct format</p>
<p>$A(x-1)(x-2) + B(x-2) + C(x-1)^2 \equiv x^2$</p>	<p>M1</p>
<p>$A = -3$</p>	<p>A1</p>
<p>$B = -1$</p>	<p>A1 (B1 if cover-up rule used)</p>
<p>$C = 4$</p>	<p>A1 (B1 if cover-up rule used)</p>

Q6 (Jun 2013, Q1)

$$\frac{(x-7)(x-2)}{(x+2)(x-1)^2} \equiv \frac{A}{x+2} + \frac{B}{(x-1)} + \frac{C}{(x-1)^2}$$

[If no partial fractions seen anywhere, B0]

$$(x-7)(x-2) \equiv A(x-1)^2 + B(x+2)(x-1) + C(x+2)$$

[Allow careless minor error but not algebraic method error]

or any equiv identity such as

$$\frac{(x-7)(x-2)}{(x-1)^2} \equiv A + \frac{B(x+2)}{(x-1)} + \frac{C(x+2)}{(x-1)^2} \text{ (or even the}$$

identity on the 1st line), in which values of x are substituted (or cfs compared)

$$A = 4, B = -3, C = 2 \text{ or } \frac{4}{x+2} - \frac{3}{x-1} + \frac{2}{(x-1)^2} \text{ ISW}$$

The 3 @ A1 are dep on the used identity being correct.

Cover-up: $A=4, C=2$ score B1,B1; $B = -3$ needs M1, then A1

B1

M1

A1,1,1

[5]

$$\underline{\text{SC}} \quad \frac{(x-7)(x-2)}{(x+2)(x-1)^2} \equiv \frac{A}{x+2} + \frac{Bx+C}{(x-1)^2}$$

[If no partial fractions seen anywhere, B0]

$$(x-7)(x-2) \equiv A(x-1)^2 + (Bx+C)(x+2)$$

[Allow careless minor error but not algebraic method error]

or any equivalent identity (as in previous column) (or even the identity on the 1st line), in which values of x are substituted (or cfs compared)

$$A = 4, B = -3, C = 5 \text{ or } \frac{4}{x+2} + \frac{-3x+5}{(x-1)^2}$$

Q7, (Edexcel 6666, Jan 2013, Q3)

$$\frac{9x^2 + 20x - 10}{(x+2)(3x-1)} \equiv 3 + \frac{5x-4}{(x+2)(3x-1)}$$

$$\text{So, } \frac{5x-4}{(x+2)(3x-1)} \equiv \frac{B}{(x+2)} + \frac{C}{(3x-1)}$$

$$5x - 4 \equiv B(3x-1) + C(x+2)$$

$$\text{Either } x: 5 = 3B + C, \text{ constant: } -4 = -B + 2C$$

or

$$x = -2 \Rightarrow -10 - 4 = -7B \Rightarrow -14 = -7B \Rightarrow B = 2$$

$$x = \frac{1}{3} \Rightarrow \frac{5}{3} - 4 = \frac{7}{3}C \Rightarrow -\frac{7}{3} = \frac{7}{3}C \Rightarrow C = -1$$

$$\text{So, } \frac{9x^2 + 20x - 10}{(x+2)(3x-1)} \equiv 3 + \frac{2}{(x+2)} - \frac{1}{(3x-1)}$$

their constant term = 3 B1

Forming a correct identity. B1

Attempts to find the value of either one of their B or their C from their identity. M1

Correct values for their B and their C , which are found using $5x - 4 \equiv B(3x-1) + C(x+2)$ A1

[4]

Q8, (Edexcel IAL, C34, Jun 2016, Q4)

<p>(a)</p>	$ \begin{array}{r} x^2 + x - 12 \overline{) x^4 + x^3 - 7x^2 + 8x - 48} \\ \underline{x^4 + x^3 - 12x^2} \\ 5x^2 + 8x - 48 \\ \underline{5x^2 + 5x - 60} \\ 3x + 12 \end{array} $ <p>M1: Divides $x^4 + x^3 - 7x^2 + 8x - 48$ by $x^2 + x - 12$ to get a quadratic quotient and a remainder of the form $\alpha x + \beta$ where α and β are not both zero</p> <p>A1: Correct quotient and remainder</p>	<p>M1A1</p>
	$ \frac{x^4 + x^3 - 7x^2 + 8x - 48}{x^2 + x - 12} \equiv x^2 + 5 + \frac{3(x+4)}{(x+4)(x-3)} $ <p>Writes their answer as</p> $ \frac{x^4 + x^3 - 7x^2 + 8x - 48}{x^2 + x - 12} \equiv \text{Their Quotient} + \frac{\text{Their Remainder}}{(x+4)(x-3)} $	<p>M1</p>
	$ \equiv x^2 + 5 + \frac{3}{(x-3)} \text{ or states } A = 5, B = 3 $	<p>A1</p>
<p>(4)</p>		

<p>(b)</p>	$ g'(x) = 2x - \frac{3}{(x-3)^2} $	<p>M1: $x^2 + A + \frac{B}{x-3} \rightarrow 2x \pm \frac{B}{(x-3)^2}$</p> <p>A1: $x^2 + A + \frac{B}{x-3} \rightarrow 2x - \frac{B}{(x-3)^2}$</p> <p>Follow through their B or the letter B or a made up B.</p>	<p>M1A1ft</p>
<p>Special Case:</p> <p>If they write $g(x)$ as $x^2 + 5 + \frac{3x+12}{(x-3)}$ and correctly attempt to differentiate as $2x +$ the quotient rule on $\frac{3x+12}{(x-3)}$ then the M mark is available but not the A1ft. It must be the correct quotient rule and the numerator must be a linear expression.</p>			
	$ g'(4) = 2 \times 4 - \frac{3}{(4-3)^2} (= 5) $	<p>Substitutes $x = 4$ into their derivative</p>	<p>M1</p>
<p>Uses $m = g'(4) = (5)$ with $(4, g(4)) = (4, 24)$ to form eqn of tangent</p>			
	$ y - 24 = 5(x - 4) $	<p>Correct method of finding an equation of the tangent. The gradient must be $g'(4)$ and the point must be an attempt on $(4, g(4))$</p>	<p>M1</p>
	$ y = 5x + 4 $	<p>Cso. This mark may be withheld for an incorrect "A" earlier or any incorrect work leading to a correct gradient.</p>	<p>A1</p>
			<p>(5)</p>

Q9, (Edexcel IAL, C34, Jun 2017, Q5)

Question Number	Scheme	Marks
5(a)	$\frac{6-5x-4x^2}{(2-x)(1+2x)} = A + \frac{B}{(2-x)} + \frac{C}{(1+2x)}$	
	$6-5x-4x^2 = A(2-x)(1+2x) + B(1+2x) + C(2-x)$	M1
	$\text{Coefficients of } x^2 \Rightarrow A = 2$	B1
	$\text{Sub } x = 2 \Rightarrow -20 = 5B \Rightarrow B = -4, \quad x = -\frac{1}{2} \Rightarrow 7.5 = 2.5C \Rightarrow C = 3$	dM1A1
		(4)
(b)	$f(x) = 2 - \frac{4}{(2-x)} + \frac{3}{(1+2x)} \Rightarrow f'(x) = -\frac{4}{(2-x)^2} - \frac{6}{(1+2x)^2}$	M1A1ftA1
		(3)
(c)	$\text{As } (2-x)^2 > 0 \text{ and } (1+2x)^2 > 0 \Rightarrow f'(x) < 0$	B1
		(1)
		(8 marks)
5 (a) alt	$\begin{array}{l} -2x^2 + 3x + 2 \sqrt{-4x^2 - 5x + 6} \\ \frac{-4x^2 + 6x + 4}{-11x + 2} \end{array} \quad \frac{-11x + 2}{(2-x)(1+2x)} = \frac{B}{(2-x)} + \frac{C}{(1+2x)}$	B1 M1
	$-11x + 2 = B(1+2x) + C(2-x)$ $\text{Sub } x = 2 \Rightarrow -20 = 5B \Rightarrow B = -4, \quad x = -\frac{1}{2} \Rightarrow 7.5 = 2.5C \Rightarrow C = 3$	dM1 A1
		(4)