Partial Fractions - Edexcel Past Exam Questions MARK SCHEME

Question 1

Question Number	Scheme	Marks
	Considers $3x^2 + 16 = A(2+x)^2 + B(1-3x)(2+x) + C(1-3x)$ and substitutes $x = -2$, or $x = 1/3$, or compares coefficients and solves simultaneous equations	M1
	To obtain A = 3, and C = 4	A1, A1
	Compares coefficients or uses simultaneous equation to show B = 0.	B1 (4)

Question 2

Question Number	Scheme		Marks
	$3x - 1 \equiv A(1-2x) + B$	Considers this identity and either substitutes $x = \frac{1}{2}$, equates coefficients or solves simultaneous equations	*complete* M1
	Let $x = \frac{1}{2}$; $\frac{3}{2} - 1 = B \Rightarrow B = \frac{1}{2}$		
	Equate x terms; $3 = -2A \Rightarrow A = -\frac{3}{2}$	$A = -\frac{3}{2}$; $B = \frac{1}{2}$	A1;A1
	(**No working seen**, but A and B correctly stated $\Rightarrow$ award all three marks. If one of A or B correctly stated give two out of the three marks available for this part.)		**[3]**

Question 3

Question Number	Scheme		Marks
	$\frac{2x-1}{(x-1)(2x-3)} \equiv \frac{A}{(x-1)} + \frac{B}{(2x-3)}$		
	$2x-1 \equiv A(2x-3)+B(x-1)$	Forming this identity. **NB**: A & B are not assigned in this question	M1
	Let $x=\frac{3}{2}$, $2 = B(\frac{1}{2}) \Rightarrow B=4$		
	Let $x=1$, $1 = A(-1) \Rightarrow A=-1$	either one of $A=-1$ or $B=4$.	A1
		both correct for their A, B.	A1
	giving $\frac{-1}{(x-1)} + \frac{4}{(2x-3)}$		**[3]**

Question 4

Question Number	Scheme	Marks
4. (a) Way 1	A method of long division gives,	
	$\frac{2(4x^2+1)}{(2x+1)(2x-1)} \equiv 2 + \frac{4}{(2x+1)(2x-1)}$ — $A = 2$	B1
	$\frac{4}{(2x+1)(2x-1)} \equiv \frac{B}{(2x+1)} + \frac{C}{(2x-1)}$	
	$4 \equiv B(2x-1) + C(2x+1)$ or their remainder, $Dx + E \equiv B(2x-1) + C(2x+1)$ — Forming any one of these two identities. Can be implied.	M1
	Let $x = -\frac{1}{2}$, $4 = -2B \Rightarrow B = -2$	
	Let $x = \frac{1}{2}$, $4 = 2C \Rightarrow C = 2$ — See note below; either one of $B = -2$ or $C = 2$	A1
	both B and C correct	A1
		[4]
Aliter 4. (a) Way 2	$\frac{2(4x^2+1)}{(2x+1)(2x-1)} \equiv A + \frac{B}{(2x+1)} + \frac{C}{(2x-1)}$	
	See below for the award of B1 — *decide to award B1 here!! ... ... for* $A = 2$	B1
	$2(4x^2+1) \equiv A(2x+1)(2x-1) + B(2x-1) + C(2x+1)$ — Forming this identity. Can be implied.	M1
	Equate x^2, $8 = 4A \Rightarrow A = 2$	
	Let $x = -\frac{1}{2}$, $4 = -2B \Rightarrow B = -2$	
	Let $x = \frac{1}{2}$, $4 = 2C \Rightarrow C = 2$ — See note below; either one of $B = -2$ or $C = 2$	A1
	both B and C correct	A1
		[4]

If a candidate states one of either B or C correctly then the method mark M1 can be implied.

Question 5

Question Number	Scheme	Marks
	$\frac{2}{4-y^2} \equiv \frac{2}{(2-y)(2+y)} \equiv \frac{A}{(2-y)} + \frac{B}{(2+y)}$ so $2 \equiv A(2+y) + B(2-y)$	M1
	Let $y=-2$, $2 = B(4) \Rightarrow B = \frac{1}{2}$, Let $y=2$, $2 = A(4) \Rightarrow A = \frac{1}{2}$	M1
	giving $\frac{\frac{1}{2}}{(2-y)} + \frac{\frac{1}{2}}{(2+y)}$	A1 cao (3)

Question 6

Question Number	Scheme		Marks
	$27x^2 + 32x + 16 \equiv A(3x+2)(1-x) + B(1-x) + C(3x+2)^2$	Forming this identity	M1
	$x = -\frac{2}{3}$, $12 - \frac{64}{3} + 16 = \left(\frac{5}{3}\right)B \Rightarrow \frac{20}{3} = \left(\frac{5}{3}\right)B \Rightarrow B = 4$ $x = 1$, $27 + 32 + 16 = 25C \Rightarrow 75 = 25C \Rightarrow C = 3$	Substitutes either $x = -\frac{2}{3}$ or $x = 1$ into their identity or equates 3 terms or substitutes in values to write down three simultaneous equations.	M1
		Both $B = 4$ and $C = 3$ **(Note the A1 is dependent on both method marks in this part.)**	A1
	Equate x^2: $27 = -3A + 9C \Rightarrow 27 = -3A + 27 \Rightarrow 0 = -3A$ $\Rightarrow A = 0$ $x = 0$, $16 = 2A + B + 4C$ $\Rightarrow 16 = 2A + 4 + 12 \Rightarrow 0 = 2A \Rightarrow A = 0$	Compares coefficients or substitutes in a third x-value or uses simultaneous equations to show $A = 0$.	B1
			[4]

Question 7

Question Number	Scheme	Marks
Q (a)	$f(x)=\frac{4-2x}{(2x+1)(x+1)(x+3)}=\frac{A}{2x+1}+\frac{B}{x+1}+\frac{C}{x+3}$	
	$4-2x=A(x+1)(x+3)+B(2x+1)(x+3)+C(2x+1)(x+1)$	M1
	A method for evaluating one constant	M1
	$x\to-\frac{1}{2},\quad 5=A\left(\frac{1}{2}\right)\left(\frac{5}{2}\right)\Rightarrow A=4$ any one correct constant	A1
	$x\to-1,\quad 6=B(-1)(2)\Rightarrow B=-3$	
	$x\to-3,\quad 10=C(-5)(-2)\Rightarrow C=1$ all three constants correct	A1 (4)

Question 8

Question Number	Scheme	Marks
	(a) $A=2$	B1
	$2x^2+5x-10=A(x-1)(x+2)+B(x+2)+C(x-1)$	
	$x\to1\quad -3=3B\Rightarrow B=-1$	M1 A1
	$x\to-2\quad -12=-3C\Rightarrow C=4$	A1 (4)

Question 9

Question Number	Scheme	Marks
(a)	$\frac{5}{(x-1)(3x+2)}=\frac{A}{x-1}+\frac{B}{3x+2}$	
	$5=A(3x+2)+B(x-1)$	
	$x\to1\quad 5=5A\Rightarrow A=1$	M1 A1
	$x\to-\frac{2}{3}\quad 5=-\frac{5}{3}B\Rightarrow B=-3$	A1 (3)

Question 10

Question Number	Scheme		Marks	
	$9x^2 = A(x-1)(2x+1) + B(2x+1) + C(x-1)^2$		B1	
	$x \to 1$ $\quad 9 = 3B \Rightarrow B = 3$		M1	
	$x \to -\frac{1}{2}$ $\quad \frac{9}{4} = \left(-\frac{3}{2}\right)^2 C \Rightarrow C = 1$	Any two of A, B, C	A1	
	x^2 terms $\quad 9 = 2A + C \Rightarrow A = 4$	All three correct	A1	**(4)** **[4]**
	Alternatives for finding A.			
	x terms $\quad 0 = -A + 2B - 2C \Rightarrow A = 4$ Constant terms $\quad 0 = -A + B + C \Rightarrow A = 4$			