Topic Y7: Binomial and partial fractions (Pre-TT) [41] MARKSCHEME

1.

(i)	$1+(-2)(-3x)+\frac{(-2)(-3)}{1.2}(-3x)^2$ (+ … ignore)	**M1**		State or imply; accept $-3x^2$ & $-9x^2$
	$= 1+6x$	**B1**		Correct first 2 terms
	$\ldots +27x^2$	**A1**	**3**	Correct third term
(ii)	$(1+2x)^2(1-3x)^{-2}$	**M1**		For changing into suitable form, seen/implied
	Attempt to expand $(1+2x)^2$ & select (at least) 2 relevant products and add	**M1**		Selection may be after multiplying out
	55 (Accept $55x^2$)	**A2√**	**4**	If (i) is $a+bx+cx^2$, f.t. $4(a+b)+c$
	SR 1 For expansion of $(1+2x)^2$ with 1 error, A1√			
	SR 2 For expansion of $(1+2x)^2$ & > 1 error, A0			
	Alternative Method			
	For correct method idea of long division	**M1**		
	1 ….. +10x ….. +55x^2	**A1,A1,A1(4)**		

2.

(i) $3x+4 \equiv A(2+x)^2+B(2+x)(1+x)+C(1+x)$	M1		Accept ≡ or =
$A = 1$	A/B1		If identity used, award 'A' mark, if
$C = 2$	A/B1		cover-up rule used, award 'B' mark.
$A+B = 0$ or $4A+3B+C=3$ or $4A+2B+C = 4$	A1		Any correct eqn for B from identity
$B = -1$	A1	**5**	
	B1		Expansion of $(1+x)^{-1}$
	B1		Expansion of $(1+\frac{1}{2}x)^{-1}$
(ii) $1 - x + x^2$	B1		First 2 terms of $(1+\frac{1}{2}x)^{-2}$
$1 - \frac{1}{2}x + \frac{1}{4}x^2$	B1		Third term of $(1+\frac{1}{2}x)^{-2}$
$1 - x + \frac{3}{4}x^2$	B1	**5**	Complete correct expansion
$1 - 5/4\,x + 5/4\,x^2$			If partial fractions not used
			Award B1 for expansion of $(1+x)^{-1}$
			B1+B1 for expansion of $(1+\frac{1}{2}x)^{-2}$,
			and B1 for 1–5/4x… & B1 for…+5/4x²
			Or if denom expanded to give
			$a+bx+cx^2$ with a=4.b=8,c=5,award B1
			Expansion of $[1+(b/a)x+(c/a)x^2]^{-1}$ =
			$1-(b/a)x+\ldots(-c/a+b^2/a^2)x^2$ B1+B1
			Final ans = (1 – 5/4x… + 5/4x²)B1+B1
	B1	**1**	Other inequalities to be discarded. **11**
(iii) $-1 < x < 1$ AEF			

3.

(i) $1-4ax+\ldots$	B1		
$\frac{-4.-5}{1.2}(ax)^2$ or $\frac{-4.-5}{1.2}a^2x^2$ or $\frac{-4.-5}{1.2}ax^2$	M1		Do not accept $\binom{-4}{2}$ unless 10 also appears
$\ldots+10a^2x^2$	A1	**3**	
(ii) f.t. (their cf x) + b(their const cf) = 1	√B1		Expect $b-4a=1$
f.t. (their cf x^2) + b(their cf x) $=-2$	√B1		Expect $10a^2-4ab=-2$
Attempt to eliminate 'b' and produce equation in 'a'	M1		Or eliminate 'a' and produce equation in 'b'
Produce $6a^2+4a=2$ AEF	A1		Or $6b^2+4b=42$ AEF
$a=\frac{1}{3}$ and $b=\frac{7}{3}$ only	A1	**5**	Made clear to be only (final) answer

4.

(i) First two terms are $1-\frac{1}{2}x\ldots\ldots$	B1		
Third term = $\frac{\frac{1}{2}.-\frac{1}{2}}{2}[(-x)^2$ or x^2 or $-x^2]$	M1		
$=-\frac{1}{8}x^2$	A1	**3**	$-\frac{1}{8}x^2$ without work → M1 A1
(ii) Attempt to replace x by $2y-4y^2$ or $2y+4y^2$	M1		or write as $1-(2y-4y^2$ or $2y+4y^2)$
First two terms are $1-y$	B1		
Third term = $+\frac{3}{2}y^2$ or $\sqrt{}\ (4b+2)y^2$	A1√	**3**	where b = cf(x^2) in part (i)

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5.

(i)		$(1-x)^{-3}=1+-3.-x+\frac{-3.-4}{2}(-x)^2+\ldots$ oe; accept $3x$ for $-3.-x$ &/or $-x^2$ or $(x)^2$ for $(-x)^2$	M1	As result is given, this expansion must be shown and then simplified. It must not just be stated as $1+3x+6x^2+\ldots$	For alternative methods such as expanding $(1-x)^3$ and multiplying by $x+3x^2+6x^3$ or using long division, consult TL
		multiplication by x to produce **AG** (Answer Given)	A1 [2]		
(ii)		Clear indication that $x=0.1$ is to be substituted	M1	e.g. $0.1+3(0.1)^2+6(0.1)^3$ stated	Calculator value → M0
		(estimated value is) $0.1+3(0.1)^2+6(0.1)^3=\underline{0.136}$	A1 [2]		(0.13717… is calculator value of $\frac{100}{729}$)
(iii)		Sight of $1-x=x\left(\frac{1}{x}-1\right)$ or $1-x=-x\left(1-\frac{1}{x}\right)$ or $\left(\frac{1}{x}-1\right)^3=-\left(1-\frac{1}{x}\right)^3$ or $(\frac{1}{x}-1)^{-3}=-\left(1-\frac{1}{x}\right)^{-3}$ or $\left(\frac{1}{x}-1\right)^{-3}=-\left(1-\frac{1}{x}\right)^{-3}$ or equivalent	B1		
		Complete satisfactory explanation (no reference to style) www	B1	(Answer Given)	
		$[1+(-3)(-\frac{1}{x})+\frac{(-3)(-4)}{2}\left(-\frac{1}{x}\right)^2+\ldots]$	M1	Simplified expansion may be quoted – it may have come from result in part (i). Answer for this expansion is not **AG**.	
		$\rightarrow-\frac{1}{x^2}-\frac{3}{x^3}-\frac{6}{x^4}$	A1 [4]		