Question	Scheme	Marks	AOs
5(a)	$-3=\frac{t-1}{2}\Rightarrow t=-5\Rightarrow y=5("-5"+2)^4$	M1	1.1b
	$(y=)\ 405$	A1	1.1b
		(2)	
(b)	$x=\frac{t-1}{2}\Rightarrow t=2x+1\Rightarrow y=5("2x+1"+2)^4$	M1	1.1b
	$y=5(2x+3)^4$	A1	1.1b
		(2)	
(c)	$("2x+3")^n\to\ldots("2x+3")^{n-1}$	M1	1.1b
	$\left(\frac{dy}{dx}=\right)40(2(-3)+3)^3$	dM1	1.1b
	$\left(\frac{dy}{dx}=\right)-1080$	A1	1.1b
		(3)	
			(7 marks)

Notes

(a) **Mark parts (a) and (b) together.**

M1: Substitutes $x=-3$ into $x=\frac{t-1}{2}$, attempts to find *t*, and substitutes their *t* into $y=5(t+2)^4$

Condone slips. May be implied by substitution of *t* = –5 into *y* or by 405 or by $y=5(-3)^4$

Alternatively, they may substitute $x=-3$ into their $y=f(x)$

A1: cao Answer only scores full marks and ISW after seeing 405 e.g. (–5, 405)
Accept (–3, 405) or e.g. *P* = 405

(b) **Mark parts (a) and (b) together.**

M1: Attempts to make *t* the subject of $x=\frac{t-1}{2}$ using the correct **order** of operations and substitutes into $y=5(t+2)^4$ Condone slips e.g. dividing by 2 first: $t=\frac{x}{2}+1$ or missing the +2 in $y=5(t+2)^4$

Alt 1: Writes $t=\left(\frac{y}{5}\right)^{\frac{1}{4}}-2$, substitutes into $x=\frac{t-1}{2}$ and attempts to make *y* the subject using the correct **order** of operations, i.e., $2x=\left(\frac{y}{5}\right)^{\frac{1}{4}}-3\Rightarrow(2x+3)^4=\frac{y}{5}\Rightarrow y=5(2x+3)^4$

Alt 2: Makes *t* the subject and then substitutes into an expanded $5(t+2)^4$
Do not be too concerned about their expansion, but it must contain t^4 and a constant term.

A1: cao and ISW after a correct answer seen. May be scored for $y=5(2x+1+2)^4$

Allow e.g. $y=80x^4+480x^3+1080x^2+1080x+405$ or e.g.

$y=5(2x+1)^4+40(2x+1)^3+120(2x+1)^2+160(2x+1)+80$

Their RHS may be unsimplified but do not allow if e.g. binomial coefficients are still present.
Do not accept f (*x*) = … It must be *y* = …

(c) Note: Differentiation seen in (a) or (b) can score marks if used in (c)

M1: Reduces the power of their $("2x+3")^n$ by one to $Q("2x+3")^{n-1}$ where Q is a constant and could be 1. There should be no other terms using this method.

Alternatively, attempts to expand their $("2x+3")^n$ (may have been expanded in (b)) and reduces the power of x by one in at least one term.

They may use parametric differentiation, i.e., $\frac{dy}{dt}=a(t+2)^3$ and $\frac{dx}{dt}=b$ where a and b are constants, leading to $\frac{dy}{dx}=\frac{a(t+2)^3}{b}$ i.e. they must divide the correct way round.

Condone attempts at the chain rule that reach e.g. $y'=\ldots u^3$ but make a slip when substituting back in for x or t, e.g., $\frac{dy}{dx}=(5x+3)^3$ or $\frac{dy}{dt}=(t+2)^2$, provided the intention is clear.

dM1: Substitutes $x=-3$ into their $\frac{dy}{dx}$ in terms of x which may be implied by their answer.

Using parametric differentiation, substitutes their t (found from an attempt at substituting $x=-3$ into $x=\frac{t-1}{2}$ which may have been seen in (a)) into their $\frac{dy}{dx}$ in terms of t.

Note for reference, if correct, the parametric differentiation is $\frac{dy}{dt}=20(t+2)^3$ and $\frac{dx}{dt}=\frac{1}{2}$ leading to $\frac{dy}{dx}=40(t+2)^3$

They may substitute their value of t into $\frac{dy}{dt}$ first before using the chain rule to reach $\frac{dy}{dx}$ which is acceptable and implies the first M mark.

A1: $\left(\frac{dy}{dx}=\right)-1080$

Correct answer only scores full marks.
May be seen labelled as m or something else.