Question	Scheme	Marks	AOs
3 (a)	Correct method used in attempting to differentiate $y = \frac{5x^2 + 10x}{(x+1)^2}$	M1	3.1a
	$\frac{dy}{dx} = \frac{(x+1)^2 \times (10x+10) - (5x^2+10x) \times 2(x+1)}{(x+1)^4} \qquad \text{oe}$	A1	1.1b
	Factorises/Cancels term in $(x+1)$ and attempts to simplify $\frac{dy}{dx} = \frac{(x+1) \times (10x+10) - (5x^2+10x) \times 2}{(x+1)^3} = \frac{A}{(x+1)^3}$	M1	2.1
	$\frac{\mathrm{d}y}{\mathrm{d}x} = \frac{10}{\left(x+1\right)^3}$	A1	1.1b
		(4)	
(b)	For $x < -1$ Follow through on their $\frac{dy}{dx} = \frac{A}{(x+1)^n}$, $n = 1, 3$	B1ft	2.2a
		(1)	
	1	<u> </u>	(5 marks)

M1: Attempts to use a correct rule to differentiate Eg: Use of quotient (& chain) rules on $y = \frac{5x^2 + 10x}{(x+1)^2}$

Alternatively uses the product (and chain) rules on $y = (5x^2 + 10x)(x+1)^{-2}$

Condone slips but expect
$$\left(\frac{dy}{dx}\right) = \frac{(x+1)^2 \times (Ax+B) - (5x^2+10x) \times (Cx+D)}{(x+1)^4}$$
 $(A, B, C, D > 0)$ or

$$\left(\frac{\mathrm{d}y}{\mathrm{d}x}\right) = \frac{\left(x+1\right)^2 \times \left(Ax+B\right) - \left(5x^2+10x\right) \times \left(Cx+D\right)}{\left(\left(x+1\right)^2\right)^2} \quad (A, B, C, D>0) \text{ using the quotient rule}$$

or $\left(\frac{\mathrm{d}y}{\mathrm{d}x}\right) = \left(x+1\right)^{-2} \times \left(Ax+B\right) + \left(5x^2+10x\right) \times C\left(x+1\right)^{-3} \quad (A, B, C\neq 0) \text{ using the product rule.}$

Condone missing brackets and slips for the M mark. For instance if they quote $u = 5x^2 + 10$, $v = (x+1)^2$ and don't make the differentiation easier, they can be awarded this mark for applying the correct rule. Also allow where they quote the correct formula, give values of u and v, but only have v rather than v^2 the denominator.

Eg.
$$\left(\frac{\mathrm{d}y}{\mathrm{d}x}\right) = \frac{\left(x+1\right)^2 \times \left(10x+10\right) - \left(5x^2+10x\right) \times 2\left(x+1\right)}{\left(x+1\right)^4}$$
 or equivalent via the quotient rule.
OR
$$\left(\frac{\mathrm{d}y}{\mathrm{d}x}\right) = \left(x+1\right)^{-2} \times \left(10x+10\right) + \left(5x^2+10x\right) \times -2\left(x+1\right)^{-3}$$
 or equivalent via the product rule

M1: A valid attempt to proceed to the given form of the answer.

It is dependent upon having a quotient rule of $\pm \frac{v du - u dv}{v^2}$ and proceeding to $\frac{A}{(x+1)^3}$

It can also be scored on a quotient rule of $\pm \frac{v du - u dv}{v}$ and proceeding to $\frac{A}{(x+1)}$

You may see candidates expanding terms in the numerator. FYI $10x^3 + 30x^2 + 30x + 10 - 10x^3 - 30x^2 - 20x^3 - 30x^3 - 30x^2 - 20x^3 - 30x^2 - 30x^$ but under this method they must reach the same expression as required by the main method.

Using the product rule expect to see a common denominator being used correctly before the above

A1:
$$\frac{dy}{dx} = \frac{10}{(x+1)^3}$$
 There is no requirement to see $\frac{dy}{dx}$ = and they can recover from missing brackets/slips.

(b)

B1ft: Score for deducing the correct answer of x < -1 This can be scored independent of their answer to part (a). Alternatively score for a correct **ft** answer for their $\frac{dy}{dx} = \frac{A}{(x+1)^n}$ where A < 0 and n = 1, 3 award for

x > -1. So	for example if	A > 0 and	$n = 1, 3 \Longrightarrow x < -1$
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Question	Scheme	Marks	AOs		
Alt via division	Writes $y = \frac{5x^2 + 10x}{(x+1)^2}$ in form $y = A \pm \frac{B}{(x+1)^2}$ $A, B \neq 0$	M1	3.1a		
	Writes $y = \frac{5x^2 + 10x}{(x+1)^2}$ in the form $y = 5 - \frac{5}{(x+1)^2}$	A1	1.1b		
	Uses the chain rule $\Rightarrow \frac{dy}{dx} = \frac{C}{(x+1)^3}$ (May be scored from $A = 0$)	M1	2.1		
	$\frac{\mathrm{d}y}{\mathrm{d}x} = \frac{10}{\left(x+1\right)^3}$ which cannot be awarded from incorrect value of A	A1	1.1b		
		(4)			
(b)	For $x < -1$ or correct follow through	B1ft	2.2a		
		(1)			
(5 marks)					