Question	Scheme	Marks
2(a)	$\dfrac{2}{\sqrt{1+3x}} = 2(1+3x)^{\left(-\frac{1}{2}\right)}$	B1
	$\{2\}\left(1+\left(-\dfrac{1}{2}\right)(3x)+\dfrac{\left(-\frac{1}{2}\right)\left(-\frac{3}{2}\right)(3x)^2}{2!}+\dfrac{\left(-\frac{1}{2}\right)\left(-\frac{3}{2}\right)\left(-\frac{5}{2}\right)(3x)^3}{3!}+\ldots\right)$	M1A1
	$2-3x+\dfrac{27x^2}{4}-\dfrac{135x^3}{8}+\ldots$	A1 [4]
(b)	$-\dfrac{1}{3}<x<\dfrac{1}{3}$ (Accept $\lvert x\rvert<\dfrac{1}{3}$)	B1 [1]
		Total 5 marks

Part	Mark	Notes
(a)	**B1**	Correct simplification of the given expression. This mark may be implied by a correct expansion.
	M1	Attempts at the binomial expansion $(1+3x)^{\pm\frac{1}{2}}$ or $2(1+3x)^{\pm\frac{1}{2}}$ For an attempt at the binomial expansion. • The first term is 1 or 2 • The powers of 3x are correct in all terms, e.g. $(3x)^2$ • The correct denominators are used, 2! and 3! oe
	A1	Allow this mark for at least 1 correct algebraic term, correctly simplified, from $-3x+\dfrac{27x^2}{4}-\dfrac{135x^3}{8}$ or $-\dfrac{3}{2}x+\dfrac{27x^2}{8}-\dfrac{135x^3}{16}$
	A1	Correct simplified expansion in ascending order, coefficients must be in simplest **fractions**. (Ignore extra terms with powers > 3) Do not isw
(b)	**B1**	For the correct range of values of x. $-\dfrac{1}{3}<x<\dfrac{1}{3}$ or $\lvert x\rvert<\dfrac{1}{3}$, do not accept $\lvert 3x\rvert<1$

ALT for (a) Uses **Maclaurin's expansion (If seen send to review)**

$$f(x)=f(0)+f'(0)x+\frac{f''(x)}{2!}x^2+\frac{f'''(x)}{3!}x^3+\ldots$$

B1 Correct simplification of the given expression.

M1 Achieves $f'(x)=P(1+3x)^{-\frac{3}{2}}, f''(x)=Q(1+3x)^{-\frac{5}{2}}, f'''(x)=R(1+3x)^{-\frac{7}{2}}, P,Q,R\neq 0$ and attempts to find the values of *f'(0), f''(0)* and *f'''(0)*

A1 Correct unsimplified expansion OR at least 2 correct simplified terms

A1 Fully correct simplified expansion. (Ignore extra terms with powers higher than 3)

For reference, the correct derivatives are:

$$f'(x)=-3(1+3x)^{-\frac{3}{2}}, f''(x)=\frac{27}{2}(1+3x)^{-\frac{5}{2}}, f'''(x)=\frac{-405}{4}(1+3x)^{-\frac{7}{2}}$$