Question Number	Scheme	Notes	Marks
6.	$y = \dfrac{1}{\sqrt{1+x^2}}$		
		$\dfrac{dy}{dx} = kx\left(1+x^2\right)^{-\frac{3}{2}}$	M1
	$\dfrac{dy}{dx} = -x(1+x^2)^{-\frac{3}{2}}$	$\dfrac{dy}{dx} = -x\left(1+x^2\right)^{-\frac{3}{2}}$. Allow in any correct unsimplified form and isw if necessary.	A1
	$\left(\dfrac{dy}{dx}\right)_{x=1} = -\dfrac{1}{2\sqrt{2}}$ $\left(-(2)^{-\frac{3}{2}}, -\dfrac{\sqrt{2}}{4} \text{ are common}\right)$	Correct value for $\dfrac{dy}{dx}$ at $x = 1$. Allow for any correct **exact** numerical possibly unsimplified expression and isw if necessary.	A1
	$\dfrac{dy}{dx} = -x(1+x^2)^{-\frac{3}{2}} \Rightarrow \dfrac{d^2y}{dx^2} = -(1+x^2)^{-\frac{3}{2}} + \dfrac{3}{2}x.2x(1+x^2)^{-\frac{5}{2}} \left(= \dfrac{2x^2-1}{\left(1+x^2\right)^{\frac{5}{2}}}\right)$ or $\dfrac{dy}{dx} = -\dfrac{x}{(1+x^2)^{\frac{3}{2}}} \Rightarrow \dfrac{d^2y}{dx^2} = \dfrac{-(1+x^2)^{\frac{3}{2}} + \dfrac{3}{2}x.2x(1+x^2)^{\frac{1}{2}}}{(1+x^2)^3} \left(= \dfrac{2x^2-1}{\left(1+x^2\right)^{\frac{5}{2}}}\right)$ **d**M1: Product rule: $\dfrac{d^2y}{dx^2} = \alpha(1+x^2)^{-\frac{3}{2}} + \beta x^2(1+x^2)^{-\frac{5}{2}}$ Quotient rule: $\dfrac{d^2y}{dx^2} = \dfrac{\alpha(1+x^2)^{\frac{3}{2}} + \beta x^2(1+x^2)^{\frac{1}{2}}}{(1+x^2)^3}$ **Dependent on the first method mark** A1: Fully correct second derivative. Allow in any correct unsimplified form and isw if necessary.		**d**M1A1
	$\left(\dfrac{d^2y}{dx^2}\right)_{x=1} = \dfrac{1}{4\sqrt{2}}$ $\left(-(2)^{-\frac{3}{2}} + 3(2)^{-\frac{5}{2}}, \dfrac{\sqrt{2}}{8} \text{ are common}\right)$	Correct value for $\dfrac{d^2y}{dx^2}$ at $x = 1$. Allow for any correct **exact** numerical possibly unsimplified expression and isw if necessary.	A1
	$f(x) = f(1) + (x-1)f'(1) + \dfrac{(x-1)^2}{2}f''(1) + \ldots$ $\left(\dfrac{1}{\sqrt{1+x^2}}\right) = \dfrac{1}{\sqrt{2}} - \dfrac{1}{2\sqrt{2}}(x-1) + \dfrac{1}{8\sqrt{2}}(x-1)^2$ M1: Attempts f (1) and applies the correct Taylor series using their values. Must see an attempt at the **first 3** terms. **If the general series is not quoted and their series does not follow their values score M0** A1: Correct expansion (allow equivalent simplified (single fraction) coefficients		M1A1
			(8)
			Total 8