Q	Marking Instructions	AO	Marks	Typical Solution
6(a)	Deduces that the lower bound of x is 1	AO2.2a	M1	$\{x \in \mathbb{R} : x > 1\}$
	States the domain in a correct form	AO2.5	A1	
6(b)	Differentiates using quotient rule (condone correct use of product rule) Must have $f'(x) = \frac{(2x-2)^{\frac{1}{2}} - kx(2x-2)^{-\frac{1}{2}}}{(2x-2)}$ OE	AO1.1a	M1	$f'(x) = \frac{(2x-2)^{\frac{1}{2}} - \frac{1}{2}x(2x-2)^{-\frac{1}{2}} \times 2}{(2x-2)}$ $= \frac{2x-2-x}{(2x-2)^{\frac{3}{2}}}$ $= \frac{x-2}{(2x-2)^{\frac{3}{2}}}$
	Obtains correct derivative in unsimplified form	AO1.1b	A1	
	Completes algebraic manipulation, with all previous working correct, to show the correct form. **AG**	AO2.1	R1	
6(c)	States that point of inflection requires second derivative to be 0	AO2.4	E1	For point of inflection $f''(x) = 0$
	Forms an equation $f''(x) = 0$ OE	AO1.1a	M1	$f''(x) = \frac{(2x-2)^{\frac{3}{2}} - \frac{3}{2}(x-2)(2x-2)^{\frac{1}{2}} \times 2}{(2x-2)^3}$
	Solves their equation	AO1.1a	M1	$(2x-2)^{\frac{3}{2}} - 3(x-2)(2x-2)^{\frac{1}{2}} = 0$
	Obtains solution $x = 4$	AO1.1b	A1	$(2x-2)^{\frac{1}{2}}\left[(2x-2) - 3(x-2)\right] = 0$ $(2x-2)^{\frac{1}{2}}(4-x) = 0$ $x = 1 \text{ or } x = 4$
	Gives a valid reason for rejecting $x = 1$, or cancels factor of $(2x-2)^{1/2}$ stating $x \neq 1$.	AO2.4	E1	$x \neq 1$ because of domain
	Tests either side of 'their' $x = 4$	AO1.1a	M1	$f''(3) = \frac{1}{32} > 0$ $f''(5) = \frac{-\sqrt{2}}{256} < 0$
	Completes rigorous argument to conclude they have one point of inflection Do not award this mark if 2nd E1 mark not awarded	AO2.1	R1	Therefore point of inflection at x=4
6(d)	Deduces values of x for convex section of graph	AO2.2a	B1	$1 < x < 4$
	Total		**13**	