Question	Answer	Marks	Guidance
(a)	$\dfrac{dy}{dx}=\left\{-k\left(3x-k\right)^{-2}\right\}\{\times 3\}\,\{+3\}$	B2, 1, 0	
	$\dfrac{-3k}{\left(3x-k\right)^{2}}+3=0$ leading to $(3)(3x-k)^{2}=(3)k$ leading to $3x-k=[\pm]\sqrt{k}$	M1	Set $\dfrac{dy}{dx}=0$ and remove the denominator
	$x=\dfrac{k\pm\sqrt{k}}{3}$	A1	OE
		4	
(b)	$a=\dfrac{4\pm\sqrt{4}}{3}$ leading to $a=2$	B1	Substitute $x=a$ when $k=4$. Allow $x=2$.
	$f''(x)=f'\left[-12\left(3x-4\right)^{-2}+3\right]=72\left(3x-4\right)^{-3}$	B1	Allow $18k\left(3x-k\right)^{-3}$
	>0 (or 9) when $x=2\rightarrow$ minimum	B1 FT	FT on *their* $x=2$, providing their $x\geqslant\dfrac{3}{2}$ and $f''(x)$ is correct
		3	

Question	Answer	Marks	Guidance
(c)	Substitute $k = -1$ leading to $g'(x) = \dfrac{3}{(3x+1)^2} + 3$	M1	Condone one error.
	$g'(x) > 0$ or $g'(x)$ always positive, hence g is an increasing function	A1	WWW. A0 if the conclusion depends on substitution of values into $g'(x)$.
	Alternative method for question 11(c)		
	$x = \dfrac{k \pm \sqrt{k}}{3}$ when $k = -1$ has no solutions, so g is increasing or decreasing	M1	Allow the statement 'no turning points' for increasing or decreasing
	Show g'(x) is positive for any value of x, hence g is an increasing function	A1	Or show g(b) > g(a) for $b > a \rightarrow$ g, hence g is an increasing function
		2	