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

Question	Answer	Marks	Guidance
(c)	Substitute $k=-1$ leading to $g'(x)=\frac{3}{(3x+1)^2}+3$	**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)		
	$x=\frac{k\pm\sqrt{k}}{3}$ 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	