Question	Answer	Marks	Guidance
11(a)	$\frac{dy}{dx}=\frac{1}{2}kx^{-\frac{1}{2}}-8x$	**B1**	
	$\frac{d^2y}{dx^2}=-\frac{1}{4}kx^{-\frac{3}{2}}-8$	**B1**	
		2	
11(b)	$x^{-\frac{1}{2}}-8x=0 \Rightarrow 1-8x^{\frac{3}{2}}=0$ or $x^{-1}=64x^2$ $\left[\Rightarrow x^3=\frac{1}{64}\text{ or } 8x^{\frac{3}{2}}=1\right]$ Setting their $\frac{dy}{dx}$ to zero and solving, providing their only error(s) are incorrect coefficients	**M1**	OE Award if working leads to $x=\frac{1}{4}$ WWW. Squaring $x^{-\frac{1}{2}}-8x^2=0$ to $x^{-1}-64x^2=0$ gets M0.
	$x=\frac{1}{4}$ only	**A1**	If $x=0$ included, A0 and max of 3/4. **SC B1** only for $x=\frac{1}{4}$ only from squaring $x^{-\frac{1}{2}}-8x^2=0$ directly to $x^{-1}-64x^2=0$ (**SC B1** replacing the M1A1).
	$y=\frac{11}{4}$	**A1**	**SC B1** for $y=\frac{11}{4}$ from squaring $x^{-\frac{1}{2}}-8x^2=0$ to $x^{-1}-64x^2=0$.
	$\frac{d^2y}{dx^2}=-\frac{1}{2}x^{-\frac{3}{2}}-8$ which is negative, so maximum	**B1 FT**	WWW FT *their* x-value and *their* $\frac{d^2y}{dx^2}$. No FT if $x=0$ is the only solution.
		4	

Question	Answer	Marks	Guidance
11(c)	When $x=1$, attempting to find $y=k-2$ and gradient $=\frac{1}{2}k-8$	M1*	OE **SC B1** if both correct gradients only, or both correct y-coordinates only.
	Equation of tangent is $y-k+2=\left(\frac{1}{2}k-8\right)(x-1)$	A1	OE, e.g. $y=\left(\frac{k}{2}-8\right)x+\frac{k}{2}+6$ or $y=\frac{k}{2}x-8x+\frac{k}{2}+6$.
	When $x=\frac{1}{4}$,attempting to find $y=\frac{1}{2}k+1.75$ and gradient $=k-2$	M1*	OE
	Equation of tangent is $y-\frac{1}{2}k-1.75=(k-2)(x-0.25)$	A1	OE, e.g. $y=(k-2)x+\frac{k}{4}+\frac{9}{4}$ or $y=kx-2x+\frac{k}{4}+\frac{9}{4}$.
	Meet at $\left(\frac{1}{2}k-8\right)(0.6-1)+k-2=(k-2)(0.6-0.25)+\frac{1}{2}k+1.75$ Equate two tangent equations and substitute $x=0.6$	DM1	OE, e.g. $\left(\frac{k}{2}-8\right)0.6+\frac{k}{2}+6=(k-2)0.6+\frac{k}{4}+\frac{9}{4}$. M0 if constants in both equations are the same.
	$\Rightarrow [-0.2k+k+3.2-2=0.35k-0.7+0.5k+1.75]$ $\Rightarrow 0.05k=0.15$ $k=3$	A1	
		6	