(d)	$6x^2-2x-8=0$ $\Rightarrow (3x-4)(x+1)=0$ $\Rightarrow x=...$	Sets their f′(x) = 0 (may be implied) and solves a 3 term quadratic. Apply general guidance if necessary. You may need to check if a calculator has been used.	M1
	$x=\frac{4}{3},\ -1\Rightarrow y=...$	Uses at least one of their x values to find a value for y using their f(x) where x is from an attempt to solve f′(x) = 0. You may need to check their y values if working is not shown.	M1
	$\left(\frac{4}{3},-\frac{100}{27}\right)$ **or** $(-1,9)$ Or e.g. $x=\frac{4}{3},\ y=-\frac{100}{27}$ and $x=-1,\ y=9$ One correct point. The fractional coordinates must be exact but allow 1.3 with a dot over the 3 and 3.703 with dots over the 7 and 3. Note that it is not necessary for the points to be written as coordinates as long as the pairing is clear. **Depends on having scored both previous M marks.**		A1
	$\left(\frac{4}{3},-\frac{100}{27}\right)$ **and** $(-1,9)$ Or e.g. $x=\frac{4}{3},\ y=-\frac{100}{27}$ and $x=-1,\ y=9$ Both correct points. The fractional coordinates must be exact but allow 1.3 with a dot over the 3 and 3.703 with dots over the 7 and 3. Note that it is not necessary for the points to be written as coordinates as long as the pairing is clear. **Depends on having scored both previous M marks.**		A1
	Fully correct answers with no working scores 4/4 following a correct part (c) i.e. $\Rightarrow f'(x)=6x^2-2x-8$		
			(4)
			Total 10

Question Number	Scheme	Notes	Marks
4(a)(i)	(–7, 9) or e.g. $x = -7, y = 9$	$x = -7$ **or** $y = 9$	B1
		$x = -7$ **and** $y = 9$	B1
	Award the marks in (a) once correct answers are seen. **Special case:** If all you see is (9, –7) award B1B0		
(a)(ii)	Examples: $r = \sqrt{\left(-3-\left("-7"\right)\right)^2+\left(12-"9"\right)^2}$ **or** $r = \sqrt{\left(-11-\left("-7"\right)\right)^2+\left(6-"9"\right)^2}$ **or** $r = \frac{1}{2}\sqrt{\left(-3+11\right)^2+\left(12-6\right)^2}$	Correct strategy for the radius. Must be a correct method for their centre (if used) **but allow 1 sign slip within one of the brackets**. A correct answer scores both marks. Must see the ½ if finding the length of the diameter.	M1
	$r = 5$	Correct radius	A1
			(4)
(b)	$\left(x+7\right)^2+\left(y-9\right)^2=5^2$ or e.g. $x^2+y^2+2\times7x-2\times9y+7^2+9^2-5^2=0$ M1: Correct attempt at circle equation using their values. Allow for $\left(x\pm\left(their-7\right)\right)^2+\left(y\pm\left(their\,9\right)\right)^2=\left(their\,numerical\,r\right)^2$ or e.g. $x^2+y^2\pm2\times\left(their-7\right)x\pm2\times\left(their\,9\right)y+\left(their-7\right)^2+\left(their\,9\right)^2-\left(their\,numerical\,r\right)^2=0$ A1: Correct equation in any form		M1A1
			(2)
(c)	$m_{radius}=\frac{12-9}{-3+7}\left(=\frac{3}{4}\right)$ **or** $m_{tangent}=-1\div\left(\frac{12-9}{-3+7}\right)\left(=-\frac{4}{3}\right)$ **or** $m_{tangent}=-\left(\frac{-3+7}{12-9}\right)\left(=-\frac{4}{3}\right)$	This mark is for an attempt to find the radius gradient **or** the tangent gradient. If the method is not clear allow one sign error in the numerator or denominator.	M1
	Alternative for the first M: $\left(x+7\right)^2+\left(y-9\right)^2=5^2\Rightarrow2\left(x+7\right)+2\left(y-9\right)\frac{dy}{dx}=0$ $\frac{dy}{dx}=\frac{x+7}{9-y}=\frac{-3+7}{9-12}\left(=-\frac{4}{3}\right)$ Allow for $\left(x+7\right)^2+\left(y-9\right)^2=5^2\Rightarrow\alpha\left(x+7\right)+\beta\left(y-9\right)\frac{dy}{dx}=0\Rightarrow\frac{dy}{dx}=...$		
	$y-12=-\frac{4}{3}\left(x+3\right)$ Uses a correct straight line method for the **tangent** using the point Q. Must be fully correct work here so must be a clear attempt at the tangent not the radius. So if the radius gradient is found previously, must apply negative reciprocal rule to their radius gradient. If using $y = mx + c$ must reach as far as $c = \ldots$		M1
	$4x+3y-24=0$	Allow any integer multiple	A1
			(3)
			Total 9