Question Number	Scheme	Marks
1.(a)	$\frac{dy}{dx} = \frac{1}{8}\times 3x^2 - 24\times -\frac{1}{2}x^{-\frac{3}{2}}$	M1
	$\frac{dy}{dx} = \frac{3}{8}x^2 + 12x^{-\frac{3}{2}}$	A1 A1 **(3)**
(b)	$\left.\frac{dy}{dx}\right\|_{x=4} = \frac{3}{8}\times 4^2 + 12\times 4^{-\frac{3}{2}} = (7.5)$	M1
	$y+3 = 7.5(x-4) \Rightarrow y = 7.5x - 33$	M1 A1 **(3)** **(6 marks)**

(a)

M1 For reducing a correct power by one on either x term. Allow for either $x^3 \to x^{3-1}$ or $x^{-\frac{1}{2}} \to x^{-\frac{1}{2}-1}$

So this **cannot** be awarded for $\frac{24}{x^{0.5}} \to \frac{24}{0.5x^{-0.5}}$

A1 One term of $\frac{3}{8}x^2 + 12x^{-\frac{3}{2}}$ correct and simplified

A1 $\frac{dy}{dx} = \frac{3}{8}x^2 + 12x^{-\frac{3}{2}}$ or exact simplified equivalent such as $\frac{dy}{dx} = \frac{3}{8}x^2 + \frac{12}{x\sqrt{x}}$.

Isw after a correct answer. There is no need to see the $\frac{dy}{dx}$

(b)

M1 For attempting to find the value of their $\frac{dy}{dx}$ at $x = 4$.

Score for sight of embedded 4's followed by an answer. Condone slips

If no calculations are seen then only award if the value is correct for their $\frac{dy}{dx}$

M1 For correct method of finding the equation of the tangent at $(4, -3)$ using their numerical $\left.\frac{dy}{dx}\right|_{x=4}$

Condone one error on the sign of the 4 and -3 within the tangent formula.

If the form $y = mx + c$ is used they must proceed as far as c = ...

It cannot be awarded from a made- up gradient

A1 $y = 7.5x - 33$ or exact equivalent in the form $y = mx + c$. ISW after a correct answer.

If the form $y = mx + c$ is used they must get correct m and c and write

$y = 7.5x - 33$ oe .....

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NB. If a calculator is used to find $\left.\frac{dy}{dx}\right|_{x=4} = 7.5$ **without sight of** $\frac{dy}{dx} = \frac{3}{8}x^2 + 12x^{-\frac{3}{2}}$ then you may allow the final two marks in (b) for correct method to find a correct tangent.

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Question Number	Scheme	Marks
2.(a)	$\frac{1}{4-2\sqrt{2}}=\frac{1}{4-2\sqrt{2}}\times\frac{4+2\sqrt{2}}{4+2\sqrt{2}}$	M1
	$=\frac{4+2\sqrt{2}}{16-8}=\frac{1}{2}+\frac{1}{4}\sqrt{2}$ oe	A1
		(2)
(b)	$4x=2\sqrt{2}x+20\sqrt{2}\Rightarrow\left(4-2\sqrt{2}\right)x=20\sqrt{2}$	M1
	$\Rightarrow x=\frac{20\sqrt{2}}{\left(4-2\sqrt{2}\right)}=20\sqrt{2}\times(a)$	dM1
	$\Rightarrow x=20\sqrt{2}\times\left(\frac{1}{2}+\frac{1}{4}\sqrt{2}\right)=10+10\sqrt{2}$	A1
		(3) **(5 marks)**

(a)

M1 For sight of $\frac{1}{4-2\sqrt{2}}\times\frac{4+2\sqrt{2}}{4+2\sqrt{2}}$ oe

A1 For achieving $\frac{1}{2}+\frac{1}{4}\sqrt{2}$ or exact equivalent such as $0.5+\frac{\sqrt{2}}{4}$, $\frac{2}{4}+\frac{2}{8}\sqrt{2}$ or correct *a* and *b*.

Remember it does not have to be simplified and isw following a correct answer

(b) Hence

M1 For attempting to collect the terms in *x* on one side of the equation and the constant term on the other side . Condone slips but there must be an attempt to collect terms with a bracket or implied bracket

dM1 For using part (a) and attempting to find $k\sqrt{2}\times(a)$

A1 $10\sqrt{2}+10$ or $10+10\sqrt{2}$ but NOT $10\left(\sqrt{2}+1\right)$. It cannot be awarded without sight of $k\sqrt{2}\times(a)$

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Otherwise (1)- SQUARING APPROACH

M1 Squaring both sides $4x=2\sqrt{2}x+20\sqrt{2}\rightarrow16x^2=8x^2+160x+800$ Condone slips on coefficients

Cannot be scored by squaring each term. Look $ax^2=px^2+qx+r$

dM1 Re-arranging and attempting to solve their 3TQ usual rules

Eg $8x^2-160x-800=0\Rightarrow x^2-20x-100=0\Rightarrow x=\frac{20\pm\sqrt{400+400}}{2}$

A1 $10\sqrt{2}+10$ or $10+10\sqrt{2}$ following a correct solution of the quadratic equation seen above.

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Otherwise (2)- REPEATING THE PROCESS OF PART (a)

M1 Rearranges $4x=2\sqrt{2}x+20\sqrt{2}\Rightarrow\left(4\pm2\sqrt{2}\right)x=20\sqrt{2}$ condoning slips. May even divide by 2 first

dM1 Then divide, rationalise and attempt to simplify. Eg $x=\frac{20\sqrt{2}}{\left(4-2\sqrt{2}\right)}\times\frac{\left(4+2\sqrt{2}\right)}{\left(4+2\sqrt{2}\right)}=\frac{80\sqrt{2}+40\sqrt{2}\times\sqrt{2}}{16-8}$ oe