The use of set notation is fine $\left\{(x,y):\frac{4}{5}x\leqslant y\leqslant -\frac{4}{3}x^2-\frac{16}{3}x+\frac{20}{3}\right\}\cap\left\{(x,y):y\geqslant -\frac{5}{4}x-\frac{25}{4}\right\}$

Spurious additional restrictions such as $x\geqslant -5$ may be seen and should not be marked as incorrect unless the additional restriction gives further restrictions on the region *R*, e.g. $y\geqslant 0$

Do not ISW here. Mark their final answer.

Question	Scheme	Marks
6(a)	$2xy-3x^2=50;\ y-x^3+6x=0$	
	$\Rightarrow 2x\left(x^3-6x\right)-3x^2=50$	**M1**
	$\Rightarrow 2x^4-12x^2-3x^2-50=0\Rightarrow 2x^4-15x^2-50=0$* CSO	**A1***
		(2)
(b)	$\Rightarrow\left(2x^2+5\right)\left(x^2-10\right)=0\Rightarrow x^2=...$	**M1**
	So $x^2=10$	**A1**
	$\Rightarrow y=\left(\sqrt{10}\right)^3-6\sqrt{10}=...$	**M1**
	one solution pair is $x=\sqrt{10}, y=4\sqrt{10}$	**A1**
	Solutions are $x=\sqrt{10}, y=4\sqrt{10}$ and $x=-\sqrt{10}, y=-4\sqrt{10}$ CSO	**A1**
		(5)
		(7 marks)

(a)

M1: Attempts to substitute their expression for *y* from rearranging the second equation into the first equation. More difficult approaches are possible, but all should lead to an equation in just *x*

E.g 1 substituting their expression for *y* from rearranging the first equation into the second equation

E.g. 2 multiplying the second equation by 2*x* and subtracting

A1*: Correct work leading to the given answer. Expect to see correct bracketing etc and at least one intermediate line with the two x^2 terms initially uncollected. See scheme

(b) This is a non calculator question so look for evidence of calculations

M1: Uses a non calculator method to solve the given quadratic in x^2.

Allow factorisation, the quadratic formula or completing the square.

You may see a substitution, say $u=x^2$. In this case it is for solving to find *u*

Condone substitutions $y=x^2$ or $x=x^2$ if it is clear what is meant.

E.g. $2x^4-15x^2-50=0\Rightarrow x=\frac{-(-15)\pm\sqrt{(-15)^2-4\times 2\times -50}}{4}=10,-\frac{5}{2}$ scores 0 unless recovered to $x^2=10$ or $x=\sqrt{10}$

A1: A correct solution for *x* or x^2 e.g. $x^2=10$, $u=10$ $x=\pm\sqrt{10}$, $x=\sqrt{10}$ etc but not *x* = 10

Candidates cannot just write down $2x^4-15x^2-50=0\Rightarrow x=\pm\sqrt{10}$

M1: Uses at least one x value of the form $p\sqrt{a}, a>0$ and uses a non calculator method to find a value for $y=q\sqrt{a}$ Must use x correctly, not x^2 in place of x. It is not a dependent mark so if $x=\sqrt{10}$ followed by a correct non calculator method you may award the mark. Some calculations must be seen, not just a written down answer. So $x=\sqrt{10}\Rightarrow y=\left(\sqrt{10}\right)^3-6\sqrt{10}=4\sqrt{10}$ is acceptable

A1: At least one correct pair of solutions. Need not be fully simplified but should be single terms, so accept e.g. $\left(\sqrt{10},\frac{40}{\sqrt{10}}\right)$ if they use the other equation to find y.

So a mark of 00110 is possible for candidates who show evidence for y but not for x.

A1: CSO. All previous marks must have been awarded in part (b). Both pairs of solutions correct and simplified with no incorrect extra answers given. Must be clearly paired so do not accept $x=\pm\sqrt{10}, y=\pm4\sqrt{10}$ unless clear pairings have been given elsewhere.

Question	Scheme	Marks
7(a)	$f'(x)=2x^{-\frac{1}{2}}+Ax^{-2}+3\Rightarrow f''(x)=...x^{-\frac{1}{2}-1}+-...x^{-2-1}$	**M1**
	$\Rightarrow f''(x)=2\times-\frac{1}{2}x^{-\frac{3}{2}}+-2Ax^{-3}=-x^{-\frac{3}{2}}-2Ax^{-3}$	**A1**
	$f''(4)=0\Rightarrow-4^{-\frac{3}{2}}-2A\times4^{-3}=0\Rightarrow A=...$	**dM1**
	$-\frac{1}{8}-\frac{2A}{64}=0\Rightarrow A=-4$	**A1**
		(4)
(b)	$f(x)=\int2x^{-\frac{1}{2}}+Ax^{-2}+3\,dx=\frac{2x^{-\frac{1}{2}+1}}{-\frac{1}{2}+1}+\frac{Ax^{-2+1}}{-2+1}+3x(+c)$	**M1**
	$=4x^{\frac{1}{2}}-\frac{A}{x}+3x(+c)$	**A1ft**
	$f(12)=8\sqrt{3}\Rightarrow4\sqrt{12}-\frac{A}{12}+36+c=8\sqrt{3}\Rightarrow c=...$	**dM1**
	$c=8\sqrt{3}-4\sqrt{12}-36-\frac{4}{12}=-\frac{109}{3}$ or follow through $c=\frac{A}{12}-36$	**A1ft**
	So $\left(f(x)\right)=4x^{\frac{1}{2}}+\frac{4}{x}+3x-\frac{109}{3}$ oe	**A1**
		(5)
		(9 marks)
Notes: Mark parts (a) and (b) together		