Question Number	Scheme	Marks
1.(a)	$y = 4x^3 + \frac{3}{2\sqrt{x}} - 8$ $\left(\frac{dy}{dx}\right) = 12x^2 - \frac{3}{4}x^{-\frac{3}{2}}$	M1, A1, A1 **(3)**
(b)	$\int 4x^3 + \frac{3}{2\sqrt{x}} - 8\,dx = x^4 + 3x^{\frac{1}{2}} - 8x + c$	M1, A1, A1 **(3)** **(6 marks)**

Advice for examiners;
If labelled (a), (b) or even (i) and (ii) mark according to the scheme as below.

If it is obvious, i.e marked $\frac{dy}{dx} = ..$ and $\int$ = mark according to the scheme as given no matter what the order

If there are no labels, mark the first answer as their attempt at $\frac{dy}{dx}$ and the second as their attempt at $\int$

If you are not sure then please use review

(a)
M1: Correct attempt at differentiation.

Award for one correct index which must be processed ie $x^3 \to x^2$ (not x^{3-1}) including $-8 \to 0$

A1: One correct and simplified term in x. So, award for sight of $12x^2$ or $-\frac{3}{4}x^{-\frac{3}{2}}$ (or exact equivalent).

A1: $\left(\frac{dy}{dx}\right) = 12x^2 - \frac{3}{4}x^{-\frac{3}{2}}$ or exact simplified equivalent such as $12x^2 - \frac{3}{4x^{\frac{3}{2}}}$ Condone $12x^2 + -\frac{3}{4}x^{-\frac{3}{2}}$.

There must be no extra terms such as + c. ISW after correct answer. There is no need to have the $\frac{dy}{dx}$

(b)
M1: Correct attempt at integration.

Award for achieving one correct index which must be processed.

Look for one of $x^3 \to x^4$, $x^{-\frac{1}{2}} \to x^{\frac{1}{2}}$ or $-8 \to -8x$

A1: Two correct and simplified terms in x

A1: $x^4 + 3x^{\frac{1}{2}} - 8x + c$ or simplified equivalent such as $1x^4 + 3\sqrt{x} - 8x^1 + c$ including the + c

Condone extra spurious notation, e.g. $\int x^4 + 3x^{\frac{1}{2}} - 8x + c$. ISW after correct answer.

Question Number	Scheme	Marks
2.(a)	Attempts to substitute $y = x+4$ into $2x^2 - xy = 8 \Rightarrow 2x^2 - x(x+4) = 8$	M1
	$\Rightarrow 2x^2 - x^2 - 4x = 8 \Rightarrow x^2 - 4x - 8 = 0$ *	A1*
		(2)
(b)	$x^2 - 4x - 8 = 0 \Rightarrow (x-2)^2 = 12$	M1
	$\Rightarrow x = 2 \pm 2\sqrt{3}$	A1
	Attempts y for either value $\Rightarrow y = 2 + 2\sqrt{3} + 4 = ...$	M1
	$\Rightarrow x = 2+2\sqrt{3}, y = 6+2\sqrt{3}$ AND $x = 2-2\sqrt{3}, y = 6-2\sqrt{3}$	A1
		(4)
		(6 marks)

(a)

M1: Awarded for an attempt to substitute $y = \pm x \pm 4$ into $2x^2 - xy = 8 \Rightarrow 2x^2 - x(\pm x \pm 4) = 8$

This may be seen with or without the bracket so look for either $2x^2 - x(\pm x \pm 4) = 8$ or $2x^2 \pm x^2 \pm 4x = 8$

A1*: Proceeds to the given answer showing all necessary steps and no errors.

For example, look for intermediate working showing ALL of the following

- $y - x = 4$ being adapted to $y = x + 4$
- A line of $2x^2 - x(x+4) = 8$ or equivalent such as $2x^2 - x^2 - 4x - 8 = 0$
- The given answer $x^2 - 4x - 8 = 0$

(b)

M1: Shows a non-calculator method of solving the given $x^2 - 4x - 8 = 0$, not any incorrect version.

Do not accept factorisation.

For completing the square look for $x^2 - 4x - 8 = 0 \Rightarrow (x-2)^2 = k, k > 0 \Rightarrow x = ...$

For use of formula look, for example, for $x^2 - 4x - 8 = 0 \Rightarrow x = \dfrac{4 \pm \sqrt{16 - (-32)}}{2}$ or $x = \dfrac{4 \pm \sqrt{48}}{2}$

You cannot accept the correct simplified solutions following a quoted formula (with no additional working shown, i.e embedded values).

A correct quoted formula followed by an unsimplified solution with a slip E.g. $x = \dfrac{-4 \pm \sqrt{(-4)^2 - (-32)}}{2}$ or $x = \dfrac{-4 \pm \sqrt{48}}{2}$ would score M1, A0 even if followed by the correct solutions and then potentially M1, A0

A1: Correctly finds both x values in an allowable form. Look for $2 + 2\sqrt{3}$ and $2 - 2\sqrt{3}$. Condone values written in the partially simplified form of $x = 2 \pm \sqrt{12}$ but not $x = \dfrac{4 \pm \sqrt{48}}{2}$. Award this mark even if one value is subsequently rejected. **This can only be scored following the award of M1**

M1: Find a y value by adding 4 to an x value.

It is not dependent so 0,0,1,0 is possible for candidates who write down solutions for the equation in x. So $x^2 - 4x - 8 = 0 \Rightarrow x = 2 \pm 2\sqrt{3}$ without working followed by $y = 6 \pm 2\sqrt{3}$ scores 0, 0, 1, 0

A1: Both pairs correctly matched up, and in the form requested by the question, i.e $p + q\sqrt{3}$

Allow $x = 2 \pm 2\sqrt{3}, y = 6 \pm 2\sqrt{3}$ Must follow M1, A1, M1

Note that a pair is matched up when you see $x = 2 + 2\sqrt{3}, y = 4 + 2 + 2\sqrt{3} = 6 + 2\sqrt{3}$