(ii) Alternative method: Attempts to rationalise first

M1: Multiplies the left hand side of the equation by $\frac{\sqrt{3}+1}{\sqrt{3}+1}$ leaving the rhs unchanged and then attempts to form a linear equation in x with x terms on one side and constants on the other. The x does not need to be factorised out from the x terms for this mark.

Condone invisible brackets even if not recovered e.g.

$$\frac{x\sqrt{3}+2}{\sqrt{3}-1}=x\sqrt{3}-4 \Rightarrow \frac{x\sqrt{3}+2\left(\sqrt{3}+1\right)}{3-1}=x\sqrt{3}-4$$

A1: A **correct** linear equation in x with terms collected and x factorised out.

dM1: Makes x the subject and correctly rationalises the denominator of x of the form $\alpha+\beta\sqrt{3}$ where α and β are non-zero.

e.g. $x=\frac{...}{\alpha+\beta\sqrt{3}}\times\frac{\alpha-\beta\sqrt{3}}{\alpha-\beta\sqrt{3}}$ oe and proceeds to an answer of the form $a+b\sqrt{3}$.

Sight of e.g. $x=\frac{10+2\sqrt{3}}{\sqrt{3}-3}\times\frac{\sqrt{3}+3}{\sqrt{3}+3}$ is sufficient but may be implied by e.g.

$$x=\frac{10+2\sqrt{3}}{\sqrt{3}-3}=\frac{10\sqrt{3}+30+6+6\sqrt{3}}{3-9}$$

A1: Reaches $-6-\frac{8}{3}\sqrt{3}$ following dM1

Allow equivalents e.g. $-\frac{36}{6}-\frac{16}{6}\sqrt{3}$ but not e.g. $\frac{-18-8\sqrt{3}}{3}$

Apply isw once the correct answer is seen.

Question Number	Scheme	Marks
	$y=\frac{1}{2}x^4-3+\frac{10}{x^2}$	
5(a)	$\left(\int \frac{1}{2}x^4-3+\frac{10}{x^2}\,\mathrm{d}x=\right)\frac{1}{10}x^5-3x-\frac{10}{x}+c$	M1A1A1
		(3)
(b)(i)	$\left(\frac{\mathrm{d}y}{\mathrm{d}x}=\right)2x^3-\frac{20}{x^3}$	M1A1A1
		(3)
(b)(ii)	$2x^3-\frac{20}{x^3}=3\Rightarrow 2x^6-20=3x^3$	M1
	$2x^6-3x^3-20=0\Rightarrow\left(2x^3+5\right)\left(x^3-4\right)=0\Rightarrow x^3=...\Rightarrow x=...$ or e.g. $x^3=a\Rightarrow(2a+5)(a-4)=0\Rightarrow a=...\Rightarrow x^3=...\Rightarrow x=...$	dM1
	$\Rightarrow x=-\sqrt[3]{\frac{5}{2}},\quad \sqrt[3]{4}$	A1A1
		(4)
		(10 marks)

Notes

(a)

M1: For increasing any power by one. E.g. $\frac{1}{2}x^4\rightarrow ...x^5$ or $-3\rightarrow ...x$ or $\frac{10}{x^2}\rightarrow ...x^{-1}$

Allow unprocessed indices for this mark e.g. $\frac{1}{2}x^4\rightarrow ...x^{4+1}$

A1: For two correct and **simplified** terms of $\frac{1}{10}x^5-3x-\frac{10}{x}$.

Allow $0.1x^5$ for $\frac{1}{10}x^5$ and $-10x^{-1}$ for $-\frac{10}{x}$.

Condone $-3x^1$ for $-3x$ and $-\frac{10}{x^1}$ for $-\frac{10}{x}$ for <u>this</u> mark.

A1: $\frac{1}{10}x^5-3x-\frac{10}{x}+c$. Must include a constant of integration.

Ignore the lhs i.e. ignore what they call their integral.

Allow $0.1x^5$ for $\frac{1}{10}x^5$ and $10x^{-1}$ for $\frac{10}{x}$.

Condone spurious integral signs e.g. $\int \frac{1}{2}x^4-3+\frac{10}{x^2}\,\mathrm{d}x=\int \frac{1}{10}x^5-3x-\frac{10}{x}+c$

Do not allow e.g. $\frac{1}{10}x^5-3x+-\frac{10}{x}+c$.