Question	Scheme	Marks	AOs
16	Sets $\mathrm{f}'(4)=0 \Rightarrow 16+2a+b=0$	M1	2.1
	Integrates $\mathrm{f}'(x)=4x+a\sqrt{x}+b \Rightarrow \{\mathrm{f}(x)=\}\,2x^2+\frac{2}{3}ax^{\frac{3}{2}}+bx\ \{+c\}$	M1 A1ft	1.1b 1.1b
	Deduces that $c=-5$	B1	2.2a
	Full and complete method using the given information $\mathrm{f}'(4)=0$ and $\mathrm{f}(4)=3$ in order to find values for a and b Note: $a=-15$ and $b=14$	ddM1	3.1a
	$\{\mathrm{f}(x)=\}\,2x^2-10x^{\frac{3}{2}}+14x-5$	A1	1.1b
		(6)	

(6 marks)

Notes:

M1: For the key step in setting $\mathrm{f}'(4)=0 \Rightarrow 16+2a+b=0$ to set up an equation in a and b.
Condone slips.

M1: For attempting to integrate $\mathrm{f}'(x)$. Award for $x^n \to x^{n+1}$ or $b \to bx$
This may come after finding values for a or b or both.

A1ft: $\{\mathrm{f}(x)=\}\,2x^2+\frac{2}{3}ax^{\frac{3}{2}}+bx\ \{+c\}$ or, e.g., $\{\mathrm{f}(x)=\}\,2x^2+\frac{2}{3}ax^{\frac{3}{2}}+(-16-2a)x\ \{+c\}$
Allow ft on their b in terms of a if they substituted in from their $\mathrm{f}'(4)=0 \Rightarrow 16+2a+b=0$
Do not ft if they have a value(s) for a or b
This may be left unsimplified but the indices must be processed.
isw once the mark is awarded. Condone the omission of the + c
This accuracy mark requires only the previous M mark to be scored.

B1: Deduces that the constant term in $\mathrm{f}(x)$ is -5.
Note that deducing $b=-5$ is B0. It must be the constant in a changed function.

ddM1: For a complete strategy to find values for both a and b.
Do not be concerned about the logistics of how they solve the simultaneous equations – this may be done on a calculator.
Note: $a=-15$ and $b=14$
This is dependent on **both** previous method marks and so must include use of both

- $\mathrm{f}'(4)=0$ (their $16+2a+b=0$ o.e.)
- $\mathrm{f}(4)=3$ (their $32+\frac{16}{3}a+4b-5=3$ o.e.)

A1: $\{\mathrm{f}(x)=\}\,2x^2-10x^{\frac{3}{2}}+14x-5$ or exact simplified equivalent, e.g., use of $x\sqrt{x}$ in place of $x^{\frac{3}{2}}$
Apply isw once a correct expression is seen.