8. Scheme – Misread in (a) and/or (b)

Question	Scheme	Marks
8(a)	$y=\frac{1}{4}x^3-8x^{\frac{1}{2}} \Rightarrow \left(\frac{\mathrm{d}y}{\mathrm{d}x}=\right)\frac{1}{4}\times 3x^2-8\times\frac{1}{2}x^{-\frac{1}{2}}$	**M1 A1**
	$\left.\frac{\mathrm{d}y}{\mathrm{d}x}\right\vert_{x=4}=\ldots(10)$	**M1**
	$y-12="10"\left(x-4\right)$	**dM1**
	$10x-y-28=0$ oe e.g. $-10x+y+28=0$	**A1**
		(5)
(b)	$\left(\mathrm{f}(x)=\right)\int\frac{1}{4}x^3-8x^{\frac{1}{2}}\,\mathrm{d}x=\frac{1}{4}\frac{x^4}{4}-\frac{8x^{\frac{3}{2}}}{\frac{3}{2}}(+c)$	**M1 A1**
	$\mathrm{f}(4)=12\Rightarrow 16-\frac{128}{3}+c=12\Rightarrow c=\ldots\left(\frac{116}{3}\right)$	**dM1 A1**
	So $\left(\mathrm{f}(x)=\right)\frac{x^4}{16}-\frac{16}{3}x^{\frac{3}{2}}+"\frac{116}{3}"$	**A1ft**
		(5)
		(10 marks)

Notes:

(a)

M1: Correct method of differentiation, at least one power reduced by 1.

Award for $\frac{1}{4}x^3\rightarrow\ldots x^2$ or $-8x^{\frac{1}{2}}\rightarrow\ldots x^{-\frac{1}{2}}$

A1: Correct differentiation, need not be simplified. Ignore any spurious "= 0".

M1: Finds $\frac{\mathrm{d}y}{\mathrm{d}x}$ at $x = 4$. Requires the substitution of $x = 4$ into a "changed" function to find a value.

Note that some candidates are using the "12" in some way to find the gradient e.g.

$$12=\frac{1}{4}\times 3(4)^2-8\times-\frac{1}{2}(4)^{-\frac{1}{2}}+c\Rightarrow c=2\Rightarrow m=2$$ and this scores M0

dM1: Depends on previous M. Correct method for the tangent **not** the normal. Uses their $\frac{\mathrm{d}y}{\mathrm{d}x}$ at $x = 4$ with $y = 12$ and $x = 4$ correctly placed. If using $y = mx + c$ they must proceed as far as finding a value for c.

A1: Correct equation in the required form including "= 0" or any non-zero integer multiple of it.

(b)

M1: Attempts to integrate f (x), look for power increased by 1 on at least one term.

Award for $\frac{1}{4}x^3\rightarrow\ldots x^4$ or $-\frac{1}{8}x^{\frac{1}{2}}\rightarrow\ldots x^{\frac{3}{2}}$

A1: Correct integration, need not be simplified. (no need for constant for this mark).

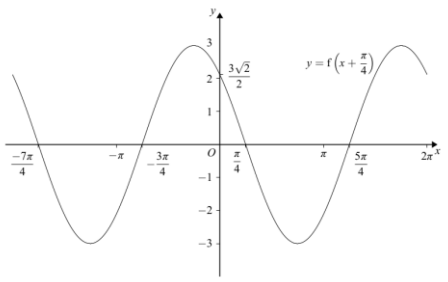
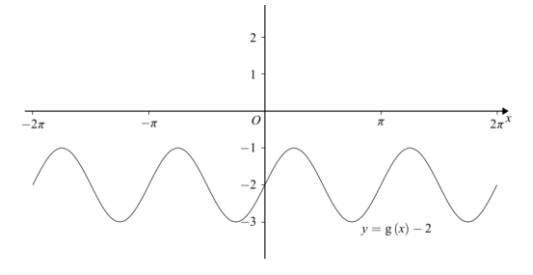
dM1: Depends on first M. Sets f (4) = 12 and proceeds to find a value for c - must have a constant of integration to score this mark.

A1: Correct value for c found.

A1ft: Correct answer following through their *c* only i.e. the algebraic part must be correct. Accept with fractional index rather than square root. Allow $0.0625x^4$ for $\frac{x^4}{16}$ and equivalent mixed fractions for $\frac{16}{3}$ and $\frac{116}{3}$. **Depends on the previous method mark.**

The "f (x) =" is **not** required so just look for the correct (or correct ft) expression. Apply isw if necessary e.g. correct work leading to $\left(\mathrm{f}(x)=\right)\frac{x^4}{16}-\frac{16}{3}x^{\frac{3}{2}}+\frac{116}{3}$ followed by $\left(\mathrm{f}(x)=\right)3x^4-256x^{\frac{3}{2}}+1856$ can score full marks in (b).

Condone poor notation e.g. leaving the final answer as $\left(\mathrm{f}(x)=\right)\int\frac{x^4}{16}-\frac{16}{3}x^{\frac{3}{2}}+\frac{116}{3}$

Question	Scheme		Marks
9(i)(a)	$\left(y=\right)3\cos\left(x\right)$		**M1 A1**
			(2)
(b)		Same shape translated left or right	**B1**
		All x intercepts labelled correctly.	**B1**
		Correct y intercept $\frac{3\sqrt{2}}{2}$	**B1**
			(3)
(ii)(a)	$\left(y=\right)\sin(2x)$		**M1 A1**
			(2)
(b)		Same shape translated down below the x-axis.	**B1**
		Correct y intercept -2 labelled.	**B1**
			(2)
			(9 marks)

Notes:

(i)(a) Remember to check the first page – (i)(a) is often attempted against the question.

M1: Identifies the curve as a cosine function of the form $\alpha\cos\left(\beta x\right)$.

Also allow for a sine function of the form $\alpha\sin\left(\beta x+\frac{\pi}{2}\right)$ oe.

A1: For a fully correct expression as shown or any equivalent. There is no requirement for $y = \ldots$ or f $(x) = \ldots$ Allow e.g. $3\cos\theta$

(b) There must be a sketch to score the marks in (i)(b) which may be done on Figure 3

B1: Applies a horizontal translation $y = f(x)$, either direction. The maximum at (0, 3) must have moved to the left or to the right of the y-axis. There should also be one minimum to the left of the y-axis and one minimum to the right of the y-axis. Ignore any scale on the y-axis.

B1: All x intercepts labelled correctly. These must be the only x intercepts and the curve must pass through these points. Allow even if there is still a maximum on the y-axis. Allow as shown or as coordinate pairs e.g. $\left(-\frac{7\pi}{4},0\right)$ and allow e.g. $\left(0,-\frac{7\pi}{4}\right)$ as long as the intercepts are in the correct positions. Condone 3sf decimal answers: Awrt –5.50(or –5.5), –2.36, 0.785, 3.93

Condone use of degrees: –315°, –135°, 45°, 225° (with or without the degrees symbol)

B1: Correct exact y intercept labelled. Allow as shown or as e.g. $\left(0,\frac{3\sqrt{2}}{2}\right)$ and allow e.g. $\left(\frac{3\sqrt{2}}{2},0\right)$ as long as it is in the correct position. It must not be a clear maximum.