Question number	Scheme	Marks
10 (a)	$f(1) = 32(1^3) - 33(1) + 1 = 0$ *	B1 cso (1)
(b)	$(x-1)(32x^2+32x-1)=0$	M1
	A correct method shown to solve a quadratic e.g. $\frac{-32 \pm \sqrt{32^2+4\times32}}{64}$	M1
	$(x=1)$ or $\frac{-4+3\sqrt{2}}{8}$ or $\frac{-4-3\sqrt{2}}{8}$	A1 A1 (4)
	Accept decimals correct to 3 sf e.g. = 0.0303… or = –1.03 …	
(c)	$\sqrt{x} = \frac{1}{8x}$	M1
	$p = \frac{1}{4}$	A1 (2)

Notes

(a)

B1 cso For substitution of 1 into $f(x)$ to obtain the given result

(b)

M1 For $(x-1)(32x^2+32x-1)=0$

M1 A correct method shown to solve a quadratic. If an algebraic method is not shown then M0A0A0 is awarded.

A1 For $\frac{-4+3\sqrt{2}}{8}$ Allow 0.0303 or better

A1 For $\frac{-4-3\sqrt{2}}{8}$ Allow -1.03 or better

(c)

M1 For equating the two equations

A1 For $p = \frac{1}{4}$

(d)	$\pi\int_{\frac{1}{4}}^{a} x \, \mathrm{d}x = \pi\left[\frac{x^2}{2}\right]_{\frac{1}{4}}^{a}$	M1
	$= \pi\left(\frac{a^2}{2} - \frac{1}{32}\right)$	A1
	$\pi\int_{\frac{1}{4}}^{a} \frac{1}{64x^2} \, \mathrm{d}x = \pi\left[-\frac{1}{64x}\right]_{\frac{1}{4}}^{a}$	M1
	$= \pi\left(\frac{1}{16} - \frac{1}{64a}\right)$	A1
	$= \pi\left(\frac{a^2}{2} - \frac{1}{32}\right) - \pi\left(\frac{1}{16} - \frac{1}{64a}\right) = \frac{27\pi}{64}$	dM1
	$32a^3 - 33a + 1 = 0$	A1
	So $a = 1$	A1 (7)
	Alternative Method	
	$\pi\int_{\frac{1}{4}}^{a}\left(x - \frac{1}{64x^2}\right) \mathrm{d}x = \frac{27\pi}{64}$	M1
	$\int_{\frac{1}{4}}^{a}\left(64x - \frac{1}{x^2}\right)\mathrm{d}x = 27$	A1
	$\left[32x^2 + \frac{1}{x}\right]_{\frac{1}{4}}^{a} = 27$	M1 A1
	$\left(32a^2 + \frac{1}{a}\right) - (2 + 4) = 27$	dM1
	$32a^3 - 33a + 1 = 0$	A1
	So $a = 1$	A1 (7) **[14]**

	Notes
(d)	
M1	For an attempt to integrate $\pi\int_{\frac{1}{4}}^{a} x\ \mathrm{d}x$ Ignore limits
A1	For $\pi\left(\frac{a^2}{2}-\frac{1}{32}\right)$
M1	For an attempt to integrate $\pi\int_{\frac{1}{4}}^{a}\frac{1}{64x^2}\ \mathrm{d}x$ Ignore limits
A1	For $=\pi\left(\frac{1}{16}-\frac{1}{64a}\right)$
M1	Dependant on at least one previous M mark being awarded - for subtraction of the two integrals.
A1	For $32a^3-33a+1=0$ oe
A1	For $a = 1$
	Alternative
M1	For $\pi\int_{\frac{1}{4}}^{a}\left(x-\frac{1}{64x^2}\right)\mathrm{d}x=\frac{27\pi}{64}$ Ignore limits
A1	For $\int_{\frac{1}{4}}^{a}\left(64x-\frac{1}{x^2}\right)\mathrm{d}x=27$ Ignore limits
M1	For an attempt to integrate $\int_{\frac{1}{4}}^{a}\left(64x-\frac{1}{x^2}\right)\mathrm{d}x$ Ignore limits
A1	$\left[32x^2+\frac{1}{x}\right]_{\frac{1}{4}}^{a}=27$
M1	Dependant on at least one previous M mark being awarded - for correct substitution of the limits
A1	For $32a^3-33a+1=0$ oe
A1	For $a = 1$