

Question Number	Scheme	Marks
7. (a)	$2x - 3\sqrt{x} - 5 = 9 \Rightarrow 2x - 3\sqrt{x} - 14 = 0$ and treats as quadratic equation $\Rightarrow (2\sqrt{x} - 7)(\sqrt{x} + 2) = 0 \Rightarrow (\sqrt{x} =) \frac{7}{2}, (-2)$ $\Rightarrow x = \left(\frac{7}{2}\right)^2 = \frac{49}{4}$	M1 A1 dM1 A1 (4)
(b)	$(f'(x) =) 2 - \frac{3}{2}x^{-\frac{1}{2}}$	B1

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	$(f''(x) =) \frac{3}{4}x^{-\frac{3}{2}}$ Attempts $\frac{3}{4}x^{-\frac{3}{2}} = 6 \Rightarrow x^{-\frac{3}{2}} = 8 \Rightarrow x = \frac{1}{4}$	M1 A1 dM1 A1 (5) (9 marks)

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3.	$\int \frac{(x+3)^2}{3\sqrt{x}} dx$ $\frac{(x+3)^2}{3\sqrt{x}} = \frac{x^2 + 6x + 9}{3\sqrt{x}} = \frac{1}{3}x^{\frac{3}{2}} + 2x^{\frac{1}{2}} + 3x^{-\frac{1}{2}}$ $\int \frac{(x+3)^2}{3\sqrt{x}} dx = \frac{1}{3} \times \frac{2}{5}x^{\frac{5}{2}} + 2 \times \frac{2}{3}x^{\frac{3}{2}} + 3 \times \frac{2}{1}x^{\frac{1}{2}} + c$ $= \frac{2}{15}x^{\frac{5}{2}} + \frac{4}{3}x^{\frac{3}{2}} + 6x^{\frac{1}{2}} + c$	M1 dM1 A1, A1, A1 (5) (5 marks)

Question Number	Scheme	Marks
1	$x^n \rightarrow x^{n+1}$ $\int \left(8x^3 - 6\sqrt{x} - \frac{2}{5x^3}\right) dx = 2x^4 - 4x^{\frac{3}{2}} + \frac{1}{5x^2} + c$	M1 A1A1A1
		(4 marks)

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9.	$\frac{4x^2 + 9}{2\sqrt{x}} = \frac{4x^2}{2\sqrt{x}} + \frac{9}{2\sqrt{x}} = 2x^{\frac{3}{2}} + \frac{9}{2}x^{-\frac{1}{2}}$ $\left(\frac{dy}{dx}\right) = 3x^{\frac{1}{2}} - \frac{9}{4}x^{-\frac{3}{2}}$ $\left(\frac{dy}{dx}\right) = 3x^{\frac{1}{2}} - \frac{9}{4}x^{-\frac{3}{2}} = 0 \Rightarrow x^2 = \frac{3}{4} \Rightarrow x = \frac{\sqrt{3}}{2}$	M1 A1 M1 A1 M1 A1 (6) (6 marks)

Question Number	Scheme	Marks
3.(a)	$\left(\frac{dy}{dx}\right) = 3x^2 + \frac{48}{\sqrt{x}}$	M1, A1, A1 (3)
(b)	$\left(\frac{d^2y}{dx^2}\right) = 6x - \frac{24}{x^{\frac{3}{2}}}$ $\Rightarrow x^{\frac{5}{2}} = \dots \quad x = 2^{\frac{4}{5}}$	M1 dM1 A1 (3) (6 marks)

Question Number	Scheme	Marks
6.(a)	$f'(x) = 5x^{\frac{3}{2}} - 40$ Attempts $5x^{\frac{3}{2}} - 40 = 0 \Rightarrow x^{\frac{3}{2}} = \dots$ $x = 4$	M1A1 M1 A1 cao (4)
(b)	$f''(x) = \frac{15}{2}x^{\frac{1}{2}} = 5$ $\Rightarrow x^{\frac{1}{2}} = \dots \Rightarrow x = \dots^2 \quad x = \frac{4}{9}$	M1 M1 A1 (3) (7 marks)

Question Number	Scheme	Marks
8 (a) (i)	$x = 4, f'(x) = 10, f'(x) = 3\sqrt{x} + kx^2 \Rightarrow 10 = 3\sqrt{4} + 4^2k \Rightarrow k = \dots$ $10 = 3 \times 2 + k \times 16 \Rightarrow k = \frac{1}{4} \quad *$	M1 A1*
(ii)	$x = 4, y = 12 \text{ on } y = 10x + c \Rightarrow 12 = 10 \times 4 + c$ $\Rightarrow c = -28$	M1 A1 (4)
(b)	$f''(x) = \frac{3}{2}x^{-\frac{1}{2}} + \frac{1}{2}x$ $\{ \Rightarrow f''(4) \} = \frac{11}{4}$	M1 A1ft A1 (3)
(c)	$f(x) = 2x^{\frac{3}{2}} + \frac{1}{12}x^3 + d$ Uses $P(4, 12) \Rightarrow 12 = 2 \times 8 + \frac{1}{12} \times 4^3 + d \Rightarrow d = \dots$ $\{ f(x) = \} 2x^{\frac{3}{2}} + \frac{1}{12}x^3 - \frac{28}{3}$	M1, A1ft dM1 A1 (4) (11 marks)