Question Number	Scheme	Marks
2. (a)	$y = 2x^{\frac{5}{2}} - 4x + 3$ $\left\{\frac{dy}{dx} =\right\} 5x^{\frac{3}{2}} - 4$	M1, A1 **(2)**
(b)	$5x^{\frac{3}{2}} - 4 = 16 \Rightarrow x^{\frac{3}{2}} = 4$ $\Rightarrow x = 4^{\frac{2}{3}} = 2^{\frac{4}{3}} \qquad \Rightarrow k = \frac{4}{3}$	M1, A1 A1 **(3)**
		(5 marks)

Note: Allow benefit of doubt if some fractional indices look like they are inline but it is clear that powers are intended.

(a)

M1: For decreasing a correct power by one including $3 \to 0$

A1: For $5x^{\frac{3}{2}} - 4$

(b)

M1: Sets their $\frac{dy}{dx} = \alpha x^{\frac{3}{2}} + \beta = 16$ and proceeds to $x^{\frac{3}{2}} = \delta$ or $\frac{dy}{dx} = \alpha\left(2^k\right)^{\frac{3}{2}} + \beta = 16$ and proceeds with correct index work to $\left(2^k\right)^{\frac{3}{2}} = q$ or $2^{pk} = q$ (oe)

A1: Achieves $x^{\frac{3}{2}} = 4$ or $\left(2^k\right)^{\frac{3}{2}} = 4$ or $2^{3k} = 16$ (oe in form $2^{pk} = q$)

A1: $k = \frac{4}{3}$ (oe) but accept $x = 2^{\frac{4}{3}}$ as long as no incorrect statement for *k* follows. Note if a decimal is given it must be recurring, not rounded.

They may use logs to solve, do not be concerned about use of rounded values in working. If $x^{\frac{3}{2}} = 4$ is achieved and they reach $k = \frac{4}{3}$ from log work even with incorrect rounding shown, assume full calculator accuracy was kept in working and award the mark.

Question Number	Scheme	Marks
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)**

M1: For an attempt to multiply out the numerator and divide at least two terms by the denominator with at least one power correct. Allow if there are only two terms from squaring.

dM1: For correctly achieving two correct powers following integration (need not be simplified).

A1: Previous dM must have been gained (so two correct powers after integrating), at least **one** correct algebraic term, allow unsimplified. E,g, allow $\frac{\frac{1}{3}}{\frac{5}{2}}x^{\frac{5}{2}}$ Allow $\frac{1}{3}(...)$ with one correct term inside the bracket.

A1: Two correct **simplified** algebraic terms. May have the $\frac{1}{3}$ factored out.

A1: Fully correct and simplified including the + *c*, accepting equivalent simplified forms. Ignore spurious extra integral signs or d*x*'s if they have the correct expression. May have the $\frac{1}{3}$ factored out. ISW if they multiply through their answer by a constant after the integration.

Note: If you see attempts at parts or substitution that look worthy of merit then send to review.