Question Number	Scheme	Marks
1. (a)	$p^{\frac{1}{2}} = \left(\frac{1}{16}x^4\right)^{\frac{1}{2}} = \frac{1}{4}x^2$	B1 **(1)**
(b)	$(pq)^{-1} = \left(\frac{1}{16}x^4 \times \frac{40}{x^3}\right)^{-1} = \left(\frac{5}{2}x\right)^{-1} = \frac{2}{5}x^{-1}$	M1, A1 **(2)**
(c)	$p\,q^2 = \frac{1}{16}x^4 \times \left(\frac{40}{x^3}\right)^2 = \frac{1600}{16} \times \frac{x^4}{x^6} = 100x^{-2}$	M1, A1 **(2)**
		(5 marks)

(a)

B1: For $\frac{1}{4}x^2$. Allow $\frac{x^2}{4}$ or $0.25\,x^2$ Condone $\pm\frac{1}{4}x^2$

Note: **final** answer below for (b) and (c) does not include going on to give alternative correct forms for the same answer. If further incorrect work follows a correct answer then do not isw but take the final expression as their answer.

(b)

M1: A **final** answer with a correct simplified coefficient or index. E.g $\frac{2}{5}x^n$, $0.4x^n$, kx^{-1} or $\frac{k}{x^1}$ (or equivalent variations) Also allow $(kx)^{-1}$

A1: A **final** answer of $\frac{2}{5}x^{-1}$ or $0.4\,x^{-1}$ but isw $\frac{2}{5x}$ following this. Incorrect "simplifications" will be A0, though.

(c)

M1: A **final** answer with a correct simplified coefficient or index. E.g $100x^n$, kx^{-2} or $\frac{k}{x^2}$

A1: A **final** answer of $100x^{-2}$ but isw $\frac{100}{x^2}$ following this. Incorrect "simplifications" will be A0, though.

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.