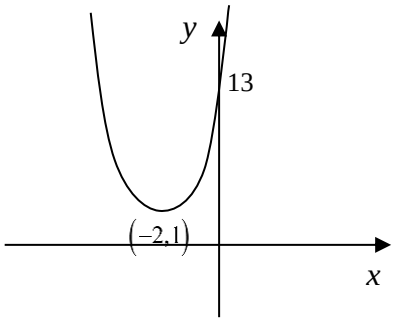
Question	Scheme		Marks
3(a)	$a = 3$		**B1**
	$b = \pm 2$		**M1**
	$3x^2 + 12x + 13 = 3\left(x + 2\right)^2 + 1$ or $a = 3,\ b = 2,\ c = 1$		**A1**
			(3)
(b)		Correct U shape with minimum in second quadrant	**B1**
		Intercept 13 on y-axis.	**B1**
		Vertex at $\left(-2,1\right)$	**B1ft**
			(3)
			(6 marks)

Notes:

(a)

B1: Correct value for a stated or shown by working.

M1: Obtains $b = \pm 2$. Allow unsimplified e.g. $b = \pm\frac{4}{2}, \pm\frac{12}{6}$. May be implied by e.g. $3\left(x \pm 2\right)^2 + ...$

A1: Fully correct expression or correct values.

Note that there are various methods e.g. $ax^2 + bx + c = a\left(x + \frac{b}{2a}\right)^2 + c - \frac{b^2}{4a} \Rightarrow 3x^2 + 12x + 13 = ...$

or $a\left(x + b\right)^2 + c = ax^2 + 2abx + ab^2 + c \Rightarrow a = 3,\ 2ab = 12, ab^2 + c = 13 \Rightarrow b, c = ...$

(b)

<u>There must be a sketch to score marks in (b)</u>

<u>Labelling on the sketch takes precedence</u>

Treat part (b) as Hence, or otherwise, i.e. part (a) may be incorrect but full marks are available in part (b) for a correct sketch of $y = 3x^2 + 12x + 13$

B1: Correct U shape with minimum point in the second quadrant but **not** on the x-axis. Do not allow a clear V shape.

B1: Correct y intercept labelled or stated. Allow as just 13 or (0, 13) or (13, 0) as long as it is in the correct position. If stated away from the sketch it must be as (0, 13) and correspond to the sketch. Their curve must at least touch at (0, 13). Any other intercepts can be ignored.

B1ft: Correct vertex labelled in some way, or follow through their b and c i.e. $x = –b$ and $y = c$. Must be a turning point but could be a maximum or a minimum. Allow the labelling as shown or as $x =.., y = …$ or as the ordinates shown on the axes. It must correspond to the sketch. If stated away from the sketch it must be correct or correct follow through and correspond to the sketch.

Question	Scheme	Marks
4(a)	$y=\dfrac{5x^2+\sqrt{x^3}}{\sqrt[3]{8x}}=\dfrac{5x^2+x^{\frac{3}{2}}}{...x^{\frac{1}{3}}}$	M1
	$=\dfrac{5x^{2-\frac{1}{3}}}{2}+\dfrac{x^{\frac{3}{2}-\frac{1}{3}}}{2}$	M1
	$=\dfrac{5}{2}x^{\frac{5}{3}}+\dfrac{1}{2}x^{\frac{7}{6}}$	A1A1
		(4)
(b)	$\left(\dfrac{\mathrm{d}y}{\mathrm{d}x}=\right)...x^{\frac{2}{3}}+...x^{\frac{1}{6}}$	M1
	$\left(\dfrac{\mathrm{d}y}{\mathrm{d}x}=\right)\dfrac{25}{6}x^{\frac{2}{3}}+\dfrac{7}{12}x^{\frac{1}{6}}$	A1ftA1
		(3)
		(7 marks)

Notes:

(a)

M1: Converts the radicals into powers of x, with at least one power correct. E.g. $\sqrt{x^3}\rightarrow x^{\frac{3}{2}}$ or $\sqrt[3]{8x}\rightarrow ...x^{\frac{1}{3}}$

M1: Correct subtraction index law seen used at least once. May be implied.

It is for $\dfrac{5x^2}{\sqrt[3]{8x}}\rightarrow\dfrac{...x^2}{...x^p}\rightarrow ...x^{2-p}$ or $\dfrac{\sqrt{x^3}}{\sqrt[3]{8x}}\rightarrow\dfrac{...x^q}{...x^p}\rightarrow ...x^{q-p}$

Indices do **not** need to be processed for this mark.

A1: One term correct (coefficient and index) or both indices correct. E.g. $\dfrac{5}{2}x^{\frac{5}{3}}$ or $\dfrac{1}{2}x^{\frac{7}{6}}$ or $...x^{\frac{5}{3}}+...x^{\frac{7}{6}}$. **Depends on both M marks.**

A1: Fully correct expression in the required form. **Depends on all previous marks.**

$y=\ldots$ is not required. Apply isw once a correct expression is seen.

(b) **The $\dfrac{\mathrm{d}y}{\mathrm{d}x}=$ is not required throughout in part (b)**

M1: $x^n\rightarrow ...x^{n-1}$ for at least one term where $n\neq 1$.

A1ft: Correct differentiation of one of their terms where $n\neq 1$.

Follow through their part (a). But not for $kx\rightarrow k$

May be unsimplified.

Depends on both M marks in part (a).

A1: Correct derivative, with terms in simplest form. Apply isw once a correct expression is seen.

Score A0 if they include "+ c"