Question Number	Scheme	Marks
9.	$\frac{4x^2+9}{2\sqrt{x}}=\frac{4x^2}{2\sqrt{x}}+\frac{9}{2\sqrt{x}}=2x^{\frac{3}{2}}+\frac{9}{2}x^{-\frac{1}{2}}$	M1 A1
	$\left(\frac{dy}{dx}=\right)\ 3x^{\frac{1}{2}}-\frac{9}{4}x^{-\frac{3}{2}}$	M1 A1
	$\left(\frac{dy}{dx}=\right)\ 3x^{\frac{1}{2}}-\frac{9}{4}x^{-\frac{3}{2}}=0\Rightarrow x^2=\frac{3}{4}\Rightarrow x=\frac{\sqrt{3}}{2}$	M1 A1 **(6)** **(6 marks)**
Alt(I)	Quotient rule	
	$u=4x^2+9, u'=8x, v=2\sqrt{x}, v'=x^{-\frac{1}{2}}$	M1A1
	$\left(\frac{dy}{dx}=\right)\ \frac{2\sqrt{x}\times 8x-(4x^2+9)\times x^{-\frac{1}{2}}}{4x}$	M1A1
	$\left(\frac{dy}{dx}=\right)\ \frac{2\sqrt{x}\times 8x-(4x^2+9)\times x^{-\frac{1}{2}}}{4x}=0\Rightarrow x^2=\frac{3}{4}\Rightarrow x=\frac{\sqrt{3}}{2}$	M1A1
Alt(II)	Product rule	
	$u=4x^2+9, u'=8x, v=\frac{1}{2}x^{-\frac{1}{2}}, v'=\frac{1}{4}x^{-\frac{3}{2}}$	M1A1
	$\left(\frac{dy}{dx}=\right)\ (4x^2+9)\times\frac{1}{4}x^{-\frac{3}{2}}+8x\times\frac{1}{2}x^{-\frac{1}{2}}$	M1A1
	$\left(\frac{dy}{dx}=\right)\ \frac{2\sqrt{x}\times 8x-(4x^2+9)\times x^{-\frac{1}{2}}}{4x}=0\Rightarrow x^2=\frac{3}{4}\Rightarrow x=\frac{\sqrt{3}}{2}$	M1A1

M1 Attempts to divide by $2\sqrt{x}$. Award for one correct term (including $\frac{9}{2x^{\frac{1}{2}}}$). Allow if they combine the two terms with a common denominator of 2, but the indices must have been processed.

If they use the quotient rule it is for selecting *u* and *v* and attempting to differentiate. Look for $u=4x^2+9, u'=...x, v=2\sqrt{x}, v'=...x^{-\frac{1}{2}}$. If they use the product rule then it is for $u=4x^2+9, u'=8x, v=\frac{1}{2}x^{-\frac{1}{2}}, v'=\frac{1}{4}x^{-\frac{3}{2}}$

A1 $2x^{\frac{3}{2}}+\frac{9}{2}x^{-\frac{1}{2}}$ which may be left unsimplified but the indices must be processed. Using the product or quotient rule it is for having correct *u'* and *v'*.

M1 Attempts to differentiate the expression written as a sum. Award for one power decreasing by one on one of their terms following through their sum and the indices must have been processed. Cannot be awarded if they just differentiate top and bottom of the fraction.

Using the quotient rule look for expressions of the form $\left(\frac{dy}{dx}=\right)\ \frac{2\sqrt{x}\times...x\pm(4x^2+9)\times...x^{-\frac{1}{2}}}{4x}$

Using the product rule look for expressions of the form $\left(\frac{dy}{dx}=\right)\ (4x^2+9)\times...x^{-\frac{3}{2}}+...x\times\frac{1}{2}x^{-\frac{1}{2}}$

A1 $\left(\frac{dy}{dx}=\right)\ 3x^{\frac{1}{2}}-\frac{9}{4}x^{-\frac{3}{2}}$ which may be left unsimplified but the indices must be processed.

Using the quotient rule award for $\left(\frac{dy}{dx}=\right)\ \frac{2\sqrt{x}\times 8x-(4x^2+9)\times x^{-\frac{1}{2}}}{4x}$.

Using the product rule award for $\left(\frac{dy}{dx}=\right)\ (4x^2+9)\times\frac{1}{4}x^{-\frac{3}{2}}+8x\times\frac{1}{2}x^{-\frac{1}{2}}$

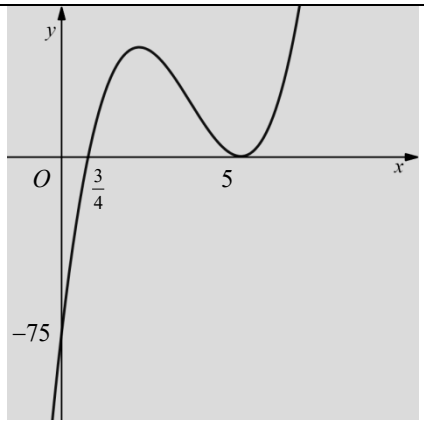
M1 Sets $\frac{dy}{dx}=0$ and proceeds to $x^{\pm 2}=...$ or $x^{\pm 4}=...$ following a derivative in the form $\left(\frac{dy}{dx}=\right)\ Ax^{\frac{1}{2}}-Bx^{-\frac{3}{2}},\quad A,B>0$ (which may be unsimplified).

Using the quotient rule or product rule look to proceed from one of the forms above to $x^{\pm 2}=...$ or $x^{\pm 4}=...$

Rounded versions of the answer do not imply this mark. Do not be too concerned by the mechanics of their arrangement but we must see some attempt to carry out algebraic manipulation proceeding to the required form.

A1 $\left(x=\right)\ \frac{\sqrt{3}}{2}$ or exact equivalent cso (Note that a correct exact answer can imply the final M1A1 but a rounded answer with no working such as awrt 0.87 is M0A0)

Withhold the final mark if $-\frac{\sqrt{3}}{2}$ is not rejected.

Question Number	Scheme	Marks
10.(a)	 Shape for +ve x^3	B1
	Cuts x-axis at $\left(\frac{3}{4},0\right)$ and meets at $(5,0)$	B1
	Crosses y-axis at $(0,-75)$	B1 **(3)**
(b)(i)	$(x=)$ 3, 20	B1ft
(ii)	$(p=)75$	B1ft **(2)**
(c) (i)	$(g(x)=)\quad (4(x+1)-3)(x+1-5)^2=(4x+1)(x-4)^2$	M1 A1
(ii)	16	B1 **(3)** **(8 marks)**

(a)

For any of the coordinates if there are contradictions between the graph and the text then the graph takes precedence.

B1 Shape for a positive cubic, any position, with one maximum and one minimum. Condone no axes for this mark. Condone cubic curves which have a cusp like appearance at the minimum point.

B1 For a graph crossing at $\left(\frac{3}{4},0\right)$ and meeting at $(5,0)$. The graph should not stop or cross at $(5,0)$.

Allow just the x values instead of the full coordinates marked on the axes or written in the text and condone a slip of x and y the wrong way round as long as the sketch would give the correct coordinates. **Only allow this mark if a graph is drawn.**

B1 For a graph crossing the y-axis at $(0,-75)$

Allow the y value to be marked instead of the full coordinate or written in the text and condone a slip of x and y the wrong way round as long as the sketch would give the correct coordinates. **Only allow this mark if a graph is drawn.** Do not condone 75 marked on the negative y-axis.