Question Number	Scheme	Marks
1(a)	$\left(\frac{\mathrm{d}y}{\mathrm{d}x}=\right) \ldots x^2+\ldots x+\ldots x^{-2}$	M1
	$\left(\frac{\mathrm{d}y}{\mathrm{d}x}=\right) \frac{3}{4}x^2-2x-17x^{-2}$	A1A1
		(3)
(b)	$\left(\frac{\mathrm{d}y}{\mathrm{d}x}=\right) \frac{3}{4}(2)^2-2(2)-17(2)^{-2}=-\frac{21}{4}$	M1
	$y-\frac{13}{2}="-\frac{21}{4}"(x-2)$	dM1
	$21x+4y-68=0$	A1
		(3)
		(6 marks)

(a)

M1 Reduces the power by 1 on any of the following terms $\ldots x^3 \to \ldots x^2$, $\ldots x^2 \to \ldots x^1$, $\ldots x^{-1} \to \ldots x^{-2}$. Be careful not to allow just sight of x^2. The index does not have to be processed for this mark.

A1 Two of $+\frac{3}{4}x^2, -2x, -17x^{-2}$ or exact unsimplified equivalent terms. Accept eg $\frac{-17}{x^2}$ but the indices must be processed. Double signs eg $+\frac{-17}{x^2}$ is fine.

A1 $\frac{3}{4}x^2-2x-17x^{-2}$ all on one line or exact simplified equivalent. Allow x^1. Withhold the final mark if they attempt to multiply all the terms by 4 for example or a +*c* appears.

(b)

M1 Attempts to substitute $x=2$ into their $\frac{\mathrm{d}y}{\mathrm{d}x}$ which must be a changed function to find the gradient of the tangent at *P*

dM1 It is for the method of finding a line passing through $\left(2, \frac{13}{2}\right)$ using their $\frac{\mathrm{d}y}{\mathrm{d}x}$ at $x=2$ eg it cannot be the gradient of the normal.

Score for sight of $y-\frac{13}{2}="-\frac{21}{4}"(x-2)$ with both coordinates substituted in correctly or if they use the form $y=mx+c$ they must proceed as far as *c* = … It is dependent on the previous method mark.

A1 $21x+4y-68=0$ or any equivalent multiple where the coefficients are integers and all terms are on one side of the equation. If they state values which contradict the equation then the equation takes precedence.

Question Number	Scheme	Marks
2(a)	$a = 2$	B1
	$b = -3$	B1
		(2)
(b)	Any two term of $\int \frac{2x^3 - 3x^2 - 32x - 15}{5\sqrt{x}}\,\mathrm{d}x = \int \frac{2}{5}x^{\frac{5}{2}} - \frac{3}{5}x^{\frac{3}{2}} - \frac{32}{5}x^{\frac{1}{2}} - 3x^{-\frac{1}{2}}\,\mathrm{d}x$	M1A1
	$x^n \to x^{n+1}$	M1
	$\frac{4}{35}x^{\frac{7}{2}} - \frac{6}{25}x^{\frac{5}{2}} - \frac{64}{15}x^{\frac{3}{2}} - 6x^{\frac{1}{2}} + c$	A1A1
		(5)
		(7 marks)

(a) If there is a contradiction between their stated values and the embedded values in a cubic expression then the embedded values take precedence.

B1 $a = 2$ which may be embedded

B1 $b = -3$ which may be embedded

(b)

M1 Attempts to write as a sum of terms. Award for any term with a correct index from correct working. The index does not need to be processed.

A1 Any **two** correct unsimplified or simplified terms of the expression $\frac{2}{5}x^{\frac{5}{2}} - \frac{3}{5}x^{\frac{3}{2}} - \frac{32}{5}x^{\frac{1}{2}} - 3x^{-\frac{1}{2}}$ oe eg $0.4x^{\frac{5}{2}} - 0.6x^{\frac{3}{2}} - 6.4x^{\frac{1}{2}} - 3x^{-\frac{1}{2}}$ (indices must be processed)

M1 Increases the power of any of their non-integer terms by 1. ($x^n \to x^{n+1}$) This mark cannot be awarded for just increasing the power by 1 on a numerator or denominator term. The index does not need to be processed.

A1 Any two terms correct unsimplified or simplified (see below). May appear in a list or on separate lines.

A1 $\frac{4}{35}x^{\frac{7}{2}} - \frac{6}{25}x^{\frac{5}{2}} - \frac{64}{15}x^{\frac{3}{2}} - 6x^{\frac{1}{2}} + c$ all on one line (including the constant c and all simplified)

Allow exact equivalents but not rounded decimals so $\frac{4}{35}$ must be written as a fraction.

Accept $\frac{4}{35}x^{\frac{7}{2}} - 0.24x^{\frac{5}{2}} - 4.2\dot{6}x^{\frac{3}{2}} - 6x^{\frac{1}{2}} + c$. Also allow terms written as eg $\frac{4}{35}x^3\sqrt{x}$ Withhold this mark if the final answer has the integral sign and dx around it or any other spurious notation.