Question Number	Scheme	Marks
3	Differentiates wrt x $\quad 3^x \ln 3 + 6\underline{\underline{\frac{dy}{dx}}} = \frac{3}{2}y^2 + 3xy\underline{\frac{dy}{dx}}$ Substitutes (2, 3) **AND** rearranges to get $\frac{dy}{dx}$ or vice versa $\Rightarrow 9\ln 3 + 6\frac{dy}{dx} = \frac{27}{2} + 18\frac{dy}{dx} \Rightarrow \frac{dy}{dx} = \frac{9\ln 3 - \frac{27}{2}}{12} = \frac{6\ln 3 - 9}{8} = \frac{-9 + \ln 729}{8}$	B1 $\underline{\underline{\text{B1}}}, \underline{\text{M1}}, \text{A1}$ M1 A1, A1 **(7)** **(7 marks)**

B1: Differentiates $3^x \rightarrow 3^x \ln 3$ or equivalent such as $e^{x\ln 3} \rightarrow e^{x\ln 3}\ln 3$

B1: Differentiates $6y \rightarrow 6\frac{dy}{dx}$

M1: Uses the product rule to differentiate $\frac{3}{2}xy^2$.

Look for sight of $\underline{py^2 + qxy\frac{dy}{dx}} \quad p, q > 0$

A1: A completely correct differential. It need not be simplified.

Variations on this include $3^x \ln 3 dx + \underline{\underline{6dy}} = \underline{\frac{3}{2}y^2 dx + 3xydy}$

Note that $\frac{dy}{dx} = 3^x \ln 3 + 6\underline{\underline{\frac{dy}{dx}}} = \underline{\frac{3}{2}y^2 + 3xy\frac{dy}{dx}}$ is A0 unless there is later recovery to the correct answer

M1: Substitutes $x = 2,\ y = 3$ into their expression to find a 'numerical' value for $\frac{dy}{dx}$

The expression must contain only two $\frac{dy}{dx}$ terms, one from differentiating $6y$, the other from differentiating $\frac{3}{2}xy^2$

Alternatively rearranges to find $\frac{dy}{dx}$ and substitutes in $x = 2,\ y = 3$ FYI a correct $\frac{dy}{dx}$ is $\frac{3^x \ln 3 - 1.5y^2}{3xy - 6}$

Condone slips (e.g. sign and coefficient slips) when rearranging or simplifying under this method.

A1: Any correct numerical answer e.g. $\frac{dy}{dx} = \frac{9\ln 3 - \frac{27}{2}}{12}$ which must be partially simplified.

So, the denominator for instance must not be left as (18 – 6)

A1: Exact answer only and in the required form.

The order of the terms on the numerator is not important so accept $\frac{\ln 729 - 9}{8}$

ISW after a correct answer

Question Number	Scheme	Marks
4 (a)	$\frac{1}{\sqrt{1-2x}} = (1-2x)^{-\frac{1}{2}} = 1+\left(-\frac{1}{2}\right)(-2x)+\frac{\left(-\frac{1}{2}\right)\left(-\frac{3}{2}\right)}{2!}(-2x)^2$	M1A1
	$\frac{2+3x}{\sqrt{1-2x}} = (2+3x)(1+x+\frac{3}{2}x^2+...$	dM1
	$= 2+5x+6x^2$ *	A1* **(4)**
(b)	Sub $x=\frac{1}{20}$ into both sides of $\frac{2+3x}{\sqrt{1-2x}} = 2+5x+6x^2$	M1
	$\frac{\frac{43}{20}}{\sqrt{\frac{9}{10}}} = \frac{453}{200} \Rightarrow \sqrt{10} = ..$	dM1
	$\sqrt{10} = \frac{1359}{430}$	A1 **(3)** **(7 marks)**

(a)

M1: Uses the binomial expansion with $n=-\frac{1}{2}$ to achieve correct binomial coefficients for terms 2 and 3 combined with the correct powers of *x*

Look for $1+\left(-\frac{1}{2}\right)(*x)+\frac{\left(-\frac{1}{2}\right)\times\left(-\frac{3}{2}\right)}{2}(*x)^2...$

or $1+\left(-\frac{1}{2}\right)(\pm 2x)+\frac{\left(-\frac{1}{2}\right)\left(-\frac{3}{2}\right)}{2!}(\pm 2x)^2$ condoning missing/invisible brackets.

If no intermediate form is seen award for $1\pm x\pm\frac{3}{2}x^2$

A1: Correct simplified or unsimplified expression for $(1-2x)^{-\frac{1}{2}}$.

The correct simplified form $1+x+\frac{3}{2}x^2$ scores M1, A1. Condone additional terms

dM1: Multiplies their binomial expansion by $(2+3x)$. It is dependent upon the previous M.

Note that this is a proof with a given answer so individual terms must be seen, and not just the simplified expansion

Look for 4 correct terms of the 5 for their $(2+3x)(1+ax+bx^2+) = 2+2ax+2bx^2+3x+3ax^2+....$

A1*: $2+5x+6x^2$ Correct answer only and it must follow all M1, A1, dM1.

There must be no extra terms