Question	Answer	Marks	Partial marks
1	Correct elimination of one unknown e.g. $\left(\frac{3}{2}\right)^4 \times \frac{1}{x} = \frac{27}{16}$ or $\left(\frac{3}{2}x\right)^4 \times \frac{1}{x^5} = \frac{27}{16}$ or $\frac{y^4}{\left(\frac{2y}{3}\right)^5} = \frac{27}{16}$ or $16\left(\frac{81}{16}x^4\right) = 27x^5$ or $16y^4 = 27\left(\frac{32}{243}y^5\right)$ oe	**M1**	
	$x = 3$ and $y = \frac{9}{2}$ oe and no other solutions	**A2**	**A1** for $x = 3$ or $y = \frac{9}{2}$ oe
2(a)	$\frac{\mathrm{d}}{\mathrm{d}x}\sqrt{1+2x} = (1+2x)^{-\frac{1}{2}}$ or $\frac{1}{2}\times(1+2x)^{-\frac{1}{2}}\times 2$ oe	**B2**	**B1** for $k(1+2x)^{-\frac{1}{2}}$ where k is a positive constant, $k \neq 1$
	$x \times their\left(\frac{1}{2}(1+2x)^{-\frac{1}{2}}\times 2\right)+[1](1+2x)^{\frac{1}{2}}$ oe, isw	**B1**	**FT** *their* $\frac{\mathrm{d}}{\mathrm{d}x}\sqrt{1+2x}$
	Alternative		
	$\frac{1}{2}\left(x^2+2x^3\right)^{-\frac{1}{2}}\times\left(2x+6x^2\right)$ or $\frac{1}{2}\left(x^2(1+2x)\right)^{-\frac{1}{2}}\times\left(2x^2+2x(1+2x)\right)$	**(B3)**	**B2** for $\frac{1}{2}\left(x^2+2x^3\right)^{-\frac{1}{2}}\times\left(ax+bx^2\right)$ or $\frac{1}{2}\left(x^2(1+2x)\right)^{-\frac{1}{2}}\times\left(ax+bx^2\right)$ where a and b are constants or **B1** for $k\left(x^2+2x^3\right)^{-\frac{1}{2}}$ or $k\left(x^2(1+2x)\right)^{-\frac{1}{2}}$ where k is a positive constant, soi
2(b)	Uses *their* $4(1+2(4))^{-\frac{1}{2}}+(1+2(4))^{\frac{1}{2}}$ in an attempt at a small changes relationship	**M1**	**FT** $x = 4$ substituted into *their* derivative
	$\frac{0.06}{\delta x} = their\left(4(1+2(4))^{-\frac{1}{2}}+(1+2(4))^{\frac{1}{2}}\right)$ oe	**M1**	**dep** previous **M1** **FT** *their* $\frac{13}{3}$
	0.0138 or 0.01384[6…] or $\frac{9}{650}$ oe nfww	**A1**	

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2(c)	$\frac{x}{\sqrt{1+2x}} + \sqrt{1+2x} = 0$ oe and solves as far as $x =$ ….	**M1**	**FT** a derivative of the form $\frac{ax}{\sqrt{1+2x}} + b\sqrt{1+2x}$ or $\frac{a}{\sqrt{1+2x}} + b\sqrt{1+2x}$ or $\frac{ax+b}{\sqrt{1+2x}}$ oe
	$x = -\frac{1}{3}$ oe	**A1**	
3(a)	$8a - 12 - 6 + b = 0$ oe and $-a - 3 + 3 + b = 0$ oe and $a = 2$, $b = 2$	**B3**	**B1** for $8a - 12 - 6 + b = 0$ oe **B1** for $-a - 3 + 3 + b = 0$ oe
3(b)	$[2x^3 - 3x^2 - 3x + 2 =]$ $(x - 2)$, $(x + 1)$, $(2x - 1)$ or $(x^2 - x - 2)$, $(2x - 1)$ **and** $x = 2, \frac{1}{2}, -1$ OR $[2x^3 - 3x^2 - 3x + 2 =]$ $(x + 1)$, $(2x^2 - 5x + 2)$ or $(x - 2)$, $(2x^2 + x - 1)$ **and** correct factorisation or method of solution of the quadratic **and** $x = 2, \frac{1}{2}, -1$ OR $2 - 1 + x = -\left(\frac{-3}{2}\right)$ or $2 - 1 + x = \frac{3}{2}$ or for $2 \times -1 \times x = \frac{-2}{2}$ or $2 \times -1 \times x = -1$ **and** $x = 2, \frac{1}{2}, -1$	**B2**	**B1** for $[2x^3 - 3x^2 - 3x + 2 =]$ $(x - 2)$ and $(x + 1)$ seen or $(x^2 - x - 2)$ seen or $(x + 1)$, $(2x^2 - 5x + 2)$ or $(x - 2)$, $(2x^2 + x - 1)$ **B1** for $2 - 1 + x = -\left(\frac{-3}{2}\right)$ or $\frac{3}{2}$ or for $2 \times -1 \times x = \frac{-2}{2}$ or -1

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