| Question | Answer | Marks | Guidance |
|---|---|---|---|
| (a) | $\frac{\mathrm{d}y}{\mathrm{d}x} = \{3\} + \left\{-4 \times \frac{1}{2}(3x+1)^{-\frac{1}{2}} \times 3\right\} \left[= 3 - 6(3x+1)^{-\frac{1}{2}}\right]$ | **B1 B1** | Correct differentiation of $3x+1$ and no other terms and correct differentiation of $-4(3x+1)^{\frac{1}{2}}$. Accept unsimplified. |
| | $\left[\frac{\mathrm{d}^2y}{\mathrm{d}x^2} =\right] -\frac{1}{2} \times -6(3x+1)^{-\frac{3}{2}} \times 3 \ [= 9(3x+1)^{-\frac{3}{2}}]$ | **B1** | WWW. Accept unsimplified. Do not award if $\frac{\mathrm{d}y}{\mathrm{d}x}$ is incorrect. |
| | | **3** | |
| (b) | $\frac{\mathrm{d}y}{\mathrm{d}x} = 0$ leading to $3 - 6(3x+1)^{-\frac{1}{2}} = 0$ | **M1** | Setting *their* $\frac{\mathrm{d}y}{\mathrm{d}x} = 0$. |
| | $(3x+1)^{\frac{1}{2}} = 2 \Rightarrow 3x+1 = 4$ leading to $x = 1$ | **A1** | CAO – do not ISW for a second answer. |
| | $y = -4$ [coordinates $(1, -4)$] | **A1** | Condone inclusion of second value from a second answer. |
| | $\frac{\mathrm{d}^2y}{\mathrm{d}x^2} = 9(3\times1+1)^{-\frac{3}{2}} = \frac{9}{8}$ or $> 0$ so minimum | **A1** | Some evidence of substitution needed but $\frac{\mathrm{d}^2y}{\mathrm{d}x^2}$. Do not award if $\frac{\mathrm{d}^2y}{\mathrm{d}x^2}$ is incorrect or wrongly evaluated. Accept correct consideration of gradients either side of $x = 1$. |
| | | **4** | |