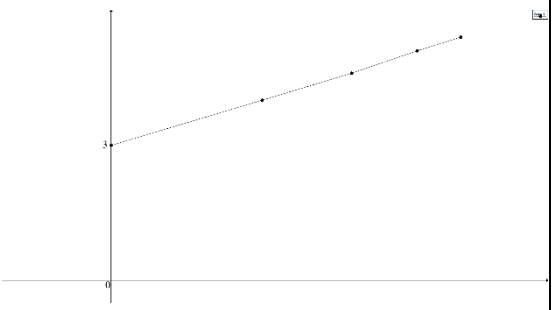
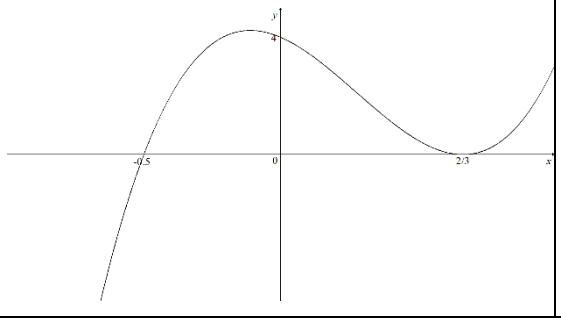
| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 4(a) | $\ln y = \ln A + b\ln x$ soi | **B1** | May be implied by parts **(b)** and **(c)** |
| | <table><tr><td>$\ln x$</td><td>0</td><td>0.69</td><td>1.1</td><td>1.4</td><td>1.6</td></tr><tr><td>$\ln y$</td><td>3</td><td>4</td><td>4.6</td><td>5.1</td><td>5.4</td></tr></table> | **2** | **M1** for attempt to plot a correct graph, allow one point error on the graph.<br>**A1** All points correct on the graph. |
| 4(b) | Vertical intercept = $\ln A$ $(=3)$ | **M1** | **Dep** on a straight line graph |
| | 20 | **A1** | |
| | Gradient = $b$ | **M1** | **Dep** on a straight line graph |
| | $b = 1.5$ (allow 1.4 to 1.6) | **A1** | |
| 4(c) | Reading off graph for $\ln x = 1.25$ to obtain $\ln y$<br>or use of *their* equation | **M1** | **Dep** on a straight line graph |
| | $120 \leqslant y \leqslant 150$ | **A1** | |
| 5(a)(i) | 5040 | **B1** | |
| 5(a)(ii) | 2520 | **B1** | |
| 5(a)(iii) | There are 504 codes less than 1000<br>$5040 - 504 = 4536$ | **2** | **M1** for *their* **(i)** $-504$ or $9\times$(a product of 3 relevant numbers) |
| 5(b) | With family: 462 | **B1** | |
| | Without family: 55 | **B1** | |
| | Total: 517 | **B1** | |
| 6(a) | $\lg 50x^3$ | **3** | **B1** for $\lg x^3$ or $\lg 2$ or $\lg 100$<br>**B1** for $\lg \frac{x^3}{2}$ |

| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 6(b) | $\log_4 a = \dfrac{1}{\log_a 4}$ | **B1** | |
| | $2(\log_a 4)^2 - 5\log_a 4 - 3 = 0$ | **M1** | For attempt to obtain a 3-term quadratic equation in $\log_a 4$ and an attempt to solve to obtain $\log_a 4 = ...$ |
| | $\log_a 4 = -\dfrac{1}{2}$, $\log_a 4 = 3$<br>$a = \dfrac{1}{16}$, $a = 4^{\frac{1}{3}}$ oe | **3** | **M1 Dep** for dealing with logarithms correctly at least once, to obtain $a = \ldots$<br>**A1** for each correct solution nfww. |
| | **Alternative:** | | |
| | $\log_a 4 = \dfrac{1}{\log_4 a}$ | **(B1)** | |
| | $3(\log_4 a)^2 + 5\log_4 a - 2 = 0$ | **(M1)** | For attempt to obtain a 3-term quadratic equation in $\log_a 4$ and an attempt to solve to obtain $\log_a 4 = ...$ |
| | $\log_4 a = -2$, $3\log_4 a = 1$<br>$a = \dfrac{1}{16}$, $a = 4^{\frac{1}{3}}$ oe | **(3)** | **M1 Dep** for dealing with logarithms correctly at least once, to obtain $a = \ldots$<br>**A1** for each correct solution nfww. |
| 7(a) | $\dfrac{dy}{dx} = 2\times 3\times (2x+1)(3x-2) + 2(3x-2)^2$ | **2** | **M1** for attempt at differentiation of a product, allow one arithmetic error.<br>**A1** all correct, allow unsimplified. |
| | $2(3x-2)(9x+1)$ | **A1** | |
| 7(b) | $\left(\dfrac{2}{3},\ 0\right)$ | **B1** | Must be from a correct derivative |
| | $\left(-\dfrac{1}{9},\ \dfrac{343}{81}\right)$ or $\left(-\dfrac{1}{9},\ 4.23\right)$ | **B1** | |
| 7(c) |  | **3** | **B1** for a correct cubic shape with a maximum in the second quadrant.<br>**B1** for $-\dfrac{1}{2}$ and $\dfrac{2}{3}$, must have a cubic shape<br>**B1** for 4 must have a cubic shape |