| Question | Answer | Marks | Partial marks |
|---|---|---|---|
| 2 | **Alternative method** | | |
| | Correct method to eliminate $x$:<br>$5(1 - \ln y) - 3\ln y = 2$ oe<br>or subtracts<br>$5x - 3\ln y = 2$ from<br>$5x + 5\ln y = 5$<br>to obtain $5\ln y - (-3\ln y) = 5 - 2$ or better | **(M1)** | |
| | $\ln y = \frac{3}{8}$ oe | **(M1)** | |
| | $y = e^{\frac{3}{8}}$ oe or 1.45 | **(A1)** | |
| | $x = \frac{5}{8}$ oe | **(A1)** | |
| 3(a) | $2x^2 + 5x - \frac{1}{2}\ln(2x+3) + c$ oe | **B3** | **B2** for $2x^2 + 5x - \frac{1}{2}\ln(2x+3)$<br>or $2x^2 + 5x - \frac{1}{2}\ln 2x + 3 + c$<br>or $2x^2 + 5x + k\ln(2x+3) + c$<br>with $k \neq 0$<br><br>or **B1** for $2x^2 + 5x + \ldots + c$<br>or $\ldots - \frac{1}{2}\ln 2x + 3$<br>or $\ldots + k\ln(2x+3)$ with $k \neq 0$ |
| 3(b) | Substitutes limits and subtracts in correct order | **M1** | **FT** *their* part (a) providing it includes a term $k\ln(2x+3)$ with $k \neq 0$ |
| | $\left[18 + 15 - \frac{1}{2}\ln 9\right] - \left[2 + 5 - \frac{1}{2}\ln 5\right]$ | **A1** | |
| | $26 - \frac{1}{2}\ln\frac{9}{5}$ or $26 + \frac{1}{2}\ln\frac{5}{9}$ oe | **A1** | |

| Question | Answer | Marks | Partial marks |
|---|---|---|---|
| 4 | $(2+ax)^5 = 2^5 + 5\times 2^4 ax + 10\times 2^3 a^2x^2 + ...$ | **B1** | |
| | $(2+ax)^5(1+bx) =$ $32 + 80ax + 80a^2x^2 + 32bx + 80abx^2...$ | **M1** | |
| | $80a + 32b = 112$ oe, isw | **A1** | |
| | $80a^2 + 80ab = -240$ oe, isw | **A1** | |
| | $3a^2 - 7a - 6 = 0$ oe | **M1** | |
| | $(3a + 2)(a - 3) = 0$ | **M1** | |
| | $a = 3$ and $b = -4$ and no other values | **A1** | |
| 5 | $[m_{\text{tangent}} =] -2px^{-3} + 5$ oe | **B1** | |
| | [When $x = 1$, $m_{\text{normal}} =$ ] $\frac{-1}{-2p+5}$ or gradient of tangent = 1 nfww | **B1** | **FT** $\frac{-1}{their \left.\frac{dy}{dx}\right\|_{x=1}}$ if appropriate |
| | $\frac{-1}{their(-2p+5)} = -1$ oe or *their*$(-2p + 5) = 1$ | **M1** | **FT** $\frac{-1}{their \left.\frac{dy}{dx}\right\|_{x=1}}$ or *their* $\left.\frac{dy}{dx}\right\|_{x=1}$ and *their* evaluation of $\frac{-1}{-1}$ |
| | $p = 2$ nfww | **A1** | |
| | [When $x = 1$] *their* $5 = -1 + q$ or $y = -x + 6$ | **M1** | **FT** $y =$ (*their p*) + 3 providing at least 2 of the first 3 marks awarded |
| | $q = 6$ nfww | **A1** | |
| 6 | $ax^2 - 5x + 2 = 2ax + x - 10$ | **M1** | |
| | $ax^2 - (2a+6)x + 12[=0]$ oe | **A1** | |
| | Correct use of $b^2 - 4ac$ [*0]: $(-(2a + 6))^2 - 4(a)(12)$ [*0] oe | **M1** | where * is any inequality sign or =; **FT** *their* 3-term quadratic in $x$ and $a$ |
| | $4a^2 - 24a + 36$ [*0] | **A1** | |
| | Factorises or solves *their* 3-term quadratic in $a$ | **M1** | **FT** *their* 3-term quadratic in $a$ |
| | $a = 3$ | **A1** | |