## MARK SCHEME NOTES

The following notes are intended to aid interpretation of mark schemes in general, but individual mark schemes may include marks awarded for specific reasons outside the scope of these notes.

### Types of mark

M Method marks, awarded for a valid method applied to the problem.

A Accuracy mark, awarded for a correct answer or intermediate step correctly obtained. For accuracy marks to be given, the associated Method mark must be earned or implied.

B Mark for a correct result or statement independent of Method marks.

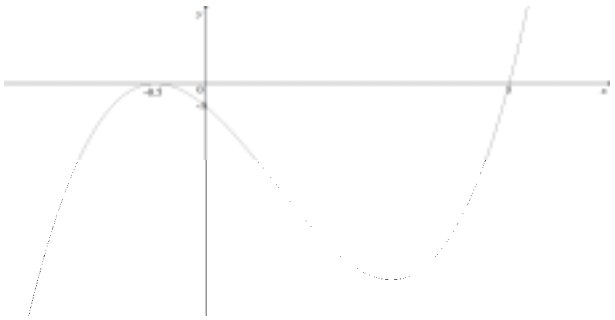
When a part of a question has two or more 'method' steps, the M marks are in principle independent unless the scheme specifically says otherwise; and similarly where there are several B marks allocated. The notation 'dep' is used to indicate that a particular M or B mark is dependent on an earlier mark in the scheme.

### Abbreviations

awrt answers which round to
cao correct answer only
dep dependent
FT follow through after error
isw ignore subsequent working
nfww not from wrong working
oe or equivalent
rot rounded or truncated
SC Special Case
soi seen or implied

| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 1 | $a = 4$ | **B1** | |
| | $b = \frac{3}{8}$ or 0.375 oe | **B1** | |
| | $c = 2$ | **B1** | |
| 2 | $6\left(2^{2x}\right) - 11\left(2^{x}\right) + 3 = 0$ soi | **B1** | |
| | $2^x = \frac{1}{3}, \quad 2^x = \frac{3}{2}$ | **2** | **M1** for solution of *their* quadratic equation in $2^x$ or appropriate substitution to obtain $2^x = ...$ |
| | $-1.58, \quad 0.58$ | **A1** | For both |

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| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 3(a) | $\frac{dy}{dx} = (2x+1)^2 + 4(2x+1)(x-3)$ or $\frac{dy}{dx} = 12x^2 - 16x - 11$ | **M1** | For correct attempt to differentiate a product or expansion and then differentiate. |
| | $x = -\frac{1}{2}, \quad \frac{11}{6}$ | **2** | **M1** for setting *their* quadratic $\frac{dy}{dx}$ to zero and attempting to solve to obtain two $x$ values. |
| | $y = 0, \quad -\frac{686}{27}$ or $-25.4$ | **A1** | For both<br>Must be separate inequalities |
| 3(b) |  | **3** | **B1** for correct shape with max on the negative $x$-axis and a min in the 4th quadrant<br>**B1** for correct $x$ intercepts $-\frac{1}{2}$ and 3. Must have a cubic curve<br>**B1** for correct $y$ intercept $-3$.<br>Must have a cubic curve |
| 3(c) | $k > 0$ | **B1** | |
| | $k < -\frac{686}{27}$ or $k < -25.4$ | **B1** | **FT** on *their* $-\frac{686}{27}$ or $-25.4$ from part (a) |
| 4 | $1 + 2e^{2x} + e^{4x}$ | **B1** | For correct integrand |
| | $x + e^{2x} + \frac{e^{4x}}{4}$ | **B2** | **B1** for 2 correct terms in integral |
| | $\left(2 + e^4 + \frac{e^8}{4}\right) - \left(1 + \frac{1}{4}\right)$ | **M1** | For correct application of limits.<br>Must be in the form $me^{4x} + ne^{2x} + x$ |
| | $\frac{3}{4} + e^4 + \frac{e^8}{4}$ | **A1** | |

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