20 MA **18** (a) Differentiate $e^{2x}(2x + 1)$ **2**

(b) Hence, find $\int (x+1)e^{2x}\,dx$. **1**

(a) Using the product rule, ✔

Let $u = e^{2x}$ $\quad \frac{du}{dx} = 2e^{2x}$

Let $v = 2x + 1$ $\quad \frac{dv}{dx} = 2$

$$\frac{d}{dx}[e^{2x}(2x + 1)] = u\frac{dv}{dx} + v\frac{du}{dx}$$
$$= e^{2x}.2 + (2x + 1).\ 2e^{2x}$$
$$= 2e^{2x} + 2e^{2x}(2x + 1)$$
$$= 2e^{2x} + 4xe^{2x} + 2e^{2x}$$
$$= 4xe^{2x} + 4e^{2x}$$
$$= 4e^{2x}(x + 1)$$ ✔

(b) From part (a), $\int 4e^{2x}(x+1)\,dx = e^{2x}(2x + 1)]$

$$\int (x+1)e^{2x}\,dx = \frac{1}{4}e^{2x}(2x + 1) + c$$

✔

State Mean:
1.72/2
0.40/1

HSC Marking Feedback

Question 18 (a)

Students should:

- understand and use the product rule to differentiate functions of the form $f(x)g(x)$
- use brackets around u or v when they have more than term.

In better responses, students were able to:

- recognise the function as a product
- apply the product rule by identifying u and v and their derivatives respectively
- apply the product rule with correct use of brackets
- fully factorise the derivative.

Areas for students to improve include:

- using the product rule on the Reference Sheet to differentiate
- writing each component of the product rule explicitly
- using brackets correctly to show a product involving more than one term
- fully factorising the derivative to support their attempt in the next part
- consulting the Reference Sheet for the derivative of exponential functions.

Question 18 (b)

Students should:

- appreciate that the wording of the question involves 'hence'
- recognise the relationship between integration and differentiation.

In better responses, students were able to:

- engage with part (a) to demonstrate the reciprocal combination
- find the integral using a fully factorised derivative
- manipulate the previous answer to enable working backwards to find the requested integral.

Areas for students to improve include:

- factorising completely
- identifying 'hence' as a key word requiring use of information obtained in the previous part
- understanding that questions worth one mark require a simple step.

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