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- 2016 12 d** (i) Differentiate  $y = xe^{3x}$ . **1**  
 (ii) Hence find the exact value of  $\int_0^2 e^{3x}(3 + 9x) dx$ . **2**

(i)  $y = xe^{3x}$

Using the product rule,

Let  $u = x$   $\frac{du}{dx} = 1$

Let  $v = e^{3x}$   $\frac{dv}{dx} = 3e^{3x}$

$$\begin{aligned}\frac{dy}{dx} &= u \frac{dv}{dx} + v \frac{du}{dx} \\ &= x \cdot 3e^{3x} + e^{3x} \cdot 1 \\ &= e^{3x} + 3xe^{3x} \\ &= e^{3x}(1 + 3x)\end{aligned}$$

State Mean:  
**0.95**

$$\begin{aligned}\text{(ii)} \quad \int_0^2 (e^{3x}(3 + 9x)) dx &= 3 \int_0^2 (e^{3x}(1 + 3x)) dx \\ &= 3 \left[ xe^{3x} \right]_0^2 \quad (\text{from part (i)}) \\ &= 3[2e^6 - 0] \\ &= 6e^6\end{aligned}$$

State Mean:  
**0.95**

\* These solutions have been provided by [projectmaths](#) and are not supplied or endorsed by BOSTES.

### BOSTES: Notes from the Marking Centre

This information is released by BOSTES in late Term 1 2017.