

# *Integrating Exponentials*

$$\int e^{ax} dx = \frac{1}{a} e^{ax} + c$$

$$\int f'(x)e^{f(x)} dx = e^{f(x)} + c$$

e.g. (i)  $\int e^{5x} dx$

$$= \frac{1}{5} e^{5x} + c$$

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**OR**

$$\int e^{5x} dx$$
$$= \frac{1}{5} \int 5e^{5x} dx$$
$$= \frac{1}{5} e^{5x} + c$$

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$$\begin{aligned} (ii) \int x e^{x^2} dx &= \frac{1}{2} \int 2x e^{x^2} dx \\ &= \frac{1}{2} e^{x^2} + c \end{aligned}$$

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$$\begin{aligned} (iii) \int e^{9x-5} dx &= \frac{1}{9} \int 9 e^{9x-5} dx \\ &= \frac{1}{9} e^{9x-5} + c \end{aligned}$$

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$$\begin{aligned} (iv) \int \sqrt{e^x} dx &= \int e^{\frac{x}{2}} dx \\ &= 2 \int \frac{1}{2} e^{\frac{x}{2}} dx \\ &= 2 e^{\frac{x}{2}} + c \\ &= \underline{2\sqrt{e^x} + c} \end{aligned}$$

$$\begin{aligned} (v) \int (e^x + 1)(e^x - 3) dx &= \int (e^{2x} - 2e^x - 3) dx \\ &= \frac{1}{2} e^{2x} - 2e^x - 3x + c \end{aligned}$$

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$$\begin{aligned} (vi) \int \frac{e^{5x} - e^x}{e^{2x}} dx &= \int (e^{3x} - e^{-x}) dx \\ &= \frac{1}{3} e^{3x} + e^{-x} + c \end{aligned}$$

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$$\begin{aligned} (vii) \quad & \int_0^1 x^2 e^{x^3} dx \\ &= \frac{1}{3} \int_0^1 3x^2 e^{x^3} dx \\ &= \frac{1}{3} \left[ e^{x^3} \right]_0^1 \\ &= \frac{1}{3} (e^1 - e^0) \\ &= \frac{1}{3} (e - 1) \end{aligned}$$

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$$\begin{aligned} (viii) \quad & \int 3^x dx \\ &= \frac{3^x}{\log 3} + c \end{aligned}$$

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**Exercise 6D; 1agi, 2bl, 3c, 4a, 5af,  
6beg, 8c, 9b, 10bd, 11bcf, 12a,  
13be, 14a, 15a, 16, 17bdf, 18**

**Exercise 6E; 4a, 5a, 6ace, 7a, 8, 10, 11,  
12b, 13, 14, 15, 16, 17**

**Exercise 6K; 7b, 10c, 13, 19c ii**