## C4 INTEGRATION *Worksheet D*

**1** Integrate with respect to $x$

**a** $2\cos x$ **b** $\sin 4x$ **c** $\cos \tfrac{1}{2}x$ **d** $\sin (x + \tfrac{\pi}{4})$

**e** $\cos (2x - 1)$ **f** $3\sin (\tfrac{\pi}{3} - x)$ **g** $\sec x \tan x$ **h** $\operatorname{cosec}^2 x$

**i** $5\sec^2 2x$ **j** $\operatorname{cosec} \tfrac{1}{4}x \cot \tfrac{1}{4}x$ **k** $\dfrac{4}{\sin^2 x}$ **l** $\dfrac{1}{\cos^2(4x+1)}$

**2** Evaluate

**a** $\int_0^{\frac{\pi}{2}} \cos x \; dx$ **b** $\int_0^{\frac{\pi}{6}} \sin 2x \; dx$ **c** $\int_0^{\frac{\pi}{2}} 2\sec \tfrac{1}{2}x \tan \tfrac{1}{2}x \; dx$

**d** $\int_0^{\frac{\pi}{3}} \cos (2x - \tfrac{\pi}{3}) \; dx$ **e** $\int_{\frac{\pi}{4}}^{\frac{\pi}{3}} \sec^2 3x \; dx$ **f** $\int_{\frac{\pi}{2}}^{\frac{2\pi}{3}} \operatorname{cosec} x \cot x \; dx$

**3** **a** Express $\tan^2 \theta$ in terms of $\sec \theta$.

**b** Show that $\int \tan^2 x \; dx = \tan x - x + c$.

**4** **a** Use the identity for $\cos (A + B)$ to express $\cos^2 A$ in terms of $\cos 2A$.

**b** Find $\int \cos^2 x \; dx$.

**5** Find

**a** $\int \sin^2 x \; dx$ **b** $\int \cot^2 2x \; dx$ **c** $\int \sin x \cos x \; dx$

**d** $\int \dfrac{\sin x}{\cos^2 x} \; dx$ **e** $\int 4\cos^2 3x \; dx$ **f** $\int (1 + \sin x)^2 \; dx$

**g** $\int (\sec x - \tan x)^2 \; dx$ **h** $\int \operatorname{cosec} 2x \cot x \; dx$ **i** $\int \cos^4 x \; dx$

**6** Evaluate

**a** $\int_0^{\frac{\pi}{2}} 2\cos^2 x \; dx$ **b** $\int_0^{\frac{\pi}{4}} \cos 2x \sin 2x \; dx$ **c** $\int_{\frac{\pi}{3}}^{\frac{\pi}{2}} \tan^2 \tfrac{1}{2}x \; dx$

**d** $\int_{\frac{\pi}{6}}^{\frac{\pi}{4}} \dfrac{\cos 2x}{\sin^2 2x} \; dx$ **e** $\int_0^{\frac{\pi}{4}} (1 - 2\sin x)^2 \; dx$ **f** $\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \sec^2 x \operatorname{cosec}^2 x \; dx$

**7** **a** Use the identities for $\sin (A + B)$ and $\sin (A - B)$ to show that

$$\sin A \cos B \equiv \tfrac{1}{2}[\sin (A + B) + \sin (A - B)].$$

**b** Find $\int \sin 3x \cos x \; dx$.

**8** Integrate with respect to $x$

**a** $2\sin 5x \sin x$ **b** $\cos 2x \cos x$ **c** $4\sin x \cos 4x$ **d** $\cos (x + \tfrac{\pi}{6}) \sin x$