1 **a** Given that $4\sin x + \cos x = 0$, show that $\tan x = -\frac{1}{4}$.

b Hence, find the values of x in the interval $0 \le x \le 360°$ for which

$$4\sin x + \cos x = 0,$$

giving your answers to 1 decimal place.

2 **a** Show that

$$5\sin^2 x + 5\sin x + 4\cos^2 x \equiv \sin^2 x + 5\sin x + 4.$$

b Hence, find the values of x in the interval $0 \le x \le 360°$ for which

$$5\sin^2 x + 5\sin x + 4\cos^2 x = 0$$

3 Solve each equation for x in the interval $0 \le x \le 360°$.
Give your answers to 1 decimal place where appropriate.

a $2\sin x - \cos x = 0$ **b** $3\sin x = 4\cos x$

c $\cos^2 x + 3\sin x - 3 = 0$ **d** $3\cos^2 x - \sin^2 x = 2$

e $2\sin^2 x + 3\cos x = 3$ **f** $3\cos^2 x = 5(1 - \sin x)$

g $3\sin x \tan x = 8$ **h** $\cos x = 3\tan x$

i $3\sin^2 x - 5\cos x + 2\cos^2 x = 0$ **j** $2\sin^2 x + 7\sin x - 2\cos^2 x = 0$

k $3\sin x - 2\tan x = 0$ **l** $\sin^2 x - 9\cos x - \cos^2 x = 5$

4 Solve each equation for θ in the interval $-\pi \le \theta \le \pi$ giving your answers in terms of π.

a $4\cos^2\theta = 1$ **b** $4\sin^2\theta + 4\sin\theta + 1 = 0$

c $\cos^2\theta + 2\cos\theta - 3 = 0$ **d** $3\sin^2\theta - \cos^2\theta = 0$

e $4\sin^2\theta - 5\sin\theta + 2\cos^2\theta = 0$ **f** $\sin^2\theta - 3\cos\theta - \cos^2\theta = 2$

5 Prove that

a $(\sin x + \cos x)^2 \equiv 1 + 2\sin x\cos x$ **b** $\frac{1}{\cos x} - \cos x \equiv \sin x\tan x, \quad \cos x \ne 0$

c $\frac{\cos^2 x}{1-\sin x} \equiv 1 + \sin x, \quad \sin x \ne 1$ **d** $\frac{1+\sin x}{\cos x} \equiv \frac{\cos x}{1-\sin x}, \quad \cos x \ne 0$

6 **a** Prove the identity

$$(\cos x - \tan x)^2 + (\sin x + 1)^2 \equiv 2 + \tan^2 x.$$

b Hence find, in terms of π, the values of x in the interval $0 \le x \le 2\pi$ such that

$$(\cos x - \tan x)^2 + (\sin x + 1)^2 = 3.$$

7 $$\mathrm{f}(x) \equiv \cos^2 x + 2\sin x, \quad 0 \le x \le 2\pi.$$

a Prove that f(x) can be expressed in the form

$$\mathrm{f}(x) = 2 - (\sin x - 1)^2.$$

b Hence deduce the maximum value of f(x) and the value of x for which this occurs.