WAVE FUNCTION **SET 2**

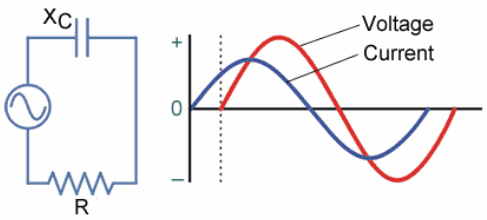
1 Prove that $\sqrt{3}\cos x + \sin x = 2\cos\left(x - \frac{\pi}{6}\right)$.

2 Express $8\cos x^\circ + 15\sin x^\circ$ as a single trigonometric function.

3 Solve $\sin x + \cos x = 1$, for $0 \le x < 2\pi$.

4 The voltage, V volts, necessary to produce a certain alternating current at time t (t > 0) can be expressed in the form

$$V = 2\sin 300t^\circ + 3\cos 300t^\circ$$



(a) Express V in the form $k\sin(300t + \alpha)^\circ$ where $0 \le \alpha \le 180^\circ$.

(b) (i) Find the maximum value of V.

(ii) Find the first time that the voltage reaches 2 volts.

5 The frequency, f hertz, of the sound of a car alarm t seconds after it starts is given by:

$$f = 2500 - 200\sin 120t^\circ + 200\sqrt{3}\cos 120t^\circ$$

(a) Express f in the form $f = 2500 + k\sin(120t + \alpha)^\circ$, where $k > 0$ and $0 \le \alpha \le 180^\circ$.

(b) Hence sketch the graph of f for $0 \le t \le 6$.

(c) If the frequency rises above 2800 hertz, the alarm may cause noise pollution. Between which times is the alarm sounding above this frequency?