

C3 TRIGONOMETRY*Worksheet F*

- 1** Express each of the following in the form $R \cos(x - \alpha)^\circ$, where $R > 0$ and $0 < \alpha < 90$. Give the values of R and α correct to 1 decimal place where appropriate.
- a** $\cos x^\circ + \sin x^\circ$ **b** $3 \cos x^\circ + 4 \sin x^\circ$
c $2 \sin x^\circ + \cos x^\circ$ **d** $\cos x^\circ + \sqrt{3} \sin x^\circ$
- 2** Express each of the following in the given form, where $R > 0$ and $0 < \alpha < 90$. Give the exact value of R and the value of α correct to 1 decimal place.
- a** $5 \cos x^\circ - 12 \sin x^\circ$, $R \cos(x + \alpha)^\circ$ **b** $4 \sin x^\circ + 2 \cos x^\circ$, $R \sin(x + \alpha)^\circ$
c $\sin x^\circ - 7 \cos x^\circ$, $R \sin(x - \alpha)^\circ$ **d** $8 \cos 2x^\circ - 15 \sin 2x^\circ$, $R \cos(2x + \alpha)^\circ$
- 3** Express each of the following in the given form, where $R > 0$ and $0 < \alpha < \frac{\pi}{2}$. Give the exact value of R and the value of α correct to 2 decimal places where appropriate.
- a** $3 \sin x - 2 \cos x$, $R \sin(x - \alpha)$ **b** $3 \cos x + \sqrt{3} \sin x$, $R \cos(x - \alpha)$
c $8 \sin 3x + 6 \cos 3x$, $R \sin(3x + \alpha)$ **d** $\cos x + \frac{1}{2} \sin x$, $R \cos(x - \alpha)$
- 4** Find the maximum value that each expression can take and the smallest positive value of x , in degrees, for which this occurs.
- a** $24 \sin x - 7 \cos x$ **b** $4 \cos 2x + 4 \sin 2x$
c $3 \cos x - 5 \sin x$ **d** $5 \sin 3x + \cos 3x$
- 5** **a** Express $3 \sin x^\circ - 3 \cos x^\circ$ in the form $R \sin(x - \alpha)^\circ$, where $R > 0$ and $0 < \alpha < 90$.
b Hence, describe two transformations that would map the graph of $y = \sin x^\circ$ onto the graph of $y = 3 \sin x^\circ - 3 \cos x^\circ$.
- 6** By first expressing each curve in an appropriate form, sketch each of the following for x in the interval $0 \leq x \leq 360^\circ$, showing the coordinates of any turning points.
- a** $y = 12 \cos x + 5 \sin x$ **b** $y = \sin x - 2 \cos x$
c $y = 2\sqrt{3} \cos x - 6 \sin x$ **d** $y = 9 \sin x + 4 \cos x$
- 7** **a** Express $\sqrt{3} \cos x - \sin x$ in the form $R \cos(x + \alpha)$, where $R > 0$ and $0 < \alpha < \frac{\pi}{2}$.
b Solve the equation $\sqrt{3} \cos x - \sin x = 1$ for x in the interval $0 \leq x \leq 2\pi$, giving your answers in terms of π .
- 8** Solve each equation for x in the interval $0 \leq x \leq 2\pi$, giving your answers to 2 decimal places.
- a** $6 \sin x + 8 \cos x = 5$ **b** $2 \cos x - 2 \sin x = 1$
c $7 \sin x - 24 \cos x - 10 = 0$ **d** $3 \cos x + \sin x + 1 = 0$
e $\cos 2x + 4 \sin 2x = 3$ **f** $5 \sin x - 8 \cos x + 7 = 0$
- 9** Solve each equation for x in the interval $-180^\circ \leq x \leq 180^\circ$, giving your answers to 1 decimal place where appropriate.
- a** $\sin x + \cos x = 1$ **b** $4 \cos x - \sin x + 2 = 0$
c $\cos \frac{x}{2} + 5 \sin \frac{x}{2} - 4 = 0$ **d** $6 \sin x = 5 - 3 \cos x$