

## STEP III, 2004, Q5

- 5 Show that if  $\cos(x - \alpha) = \cos \beta$  then either  $\tan x = \tan(\alpha + \beta)$  or  $\tan x = \tan(\alpha - \beta)$ . By choosing suitable values of  $x$ ,  $\alpha$  and  $\beta$ , give an example to show that if  $\tan x = \tan(\alpha + \beta)$ , then  $\cos(x - \alpha)$  need not equal  $\cos \beta$ .

Let  $\omega$  be the acute angle such that  $\tan \omega = \frac{4}{3}$ .

- (i) For  $0 \leq x \leq 2\pi$ , solve the equation

$$\cos x - 7 \sin x = 5$$

giving both solutions in terms of  $\omega$ .

- (i) For  $0 \leq x \leq 2\pi$ , solve the equation

$$2 \cos x + 11 \sin x = 10$$

showing that one solution is twice the other and giving both in terms of  $\omega$ .



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