TRIGONOMETRY AND MODELLING

– ADDITION FORMULAE (IN THE FORMULA BOOKLET)

$$\sin(A+B) = \sin A\cos B + \cos A\sin B$$
$$\sin(A-B) = \sin A\cos B - \cos A\sin B$$

$$\cos(A+B) = \cos A\cos B - \sin A\sin B$$
$$\cos(A-B) = \cos A\cos B + \sin A\sin B$$

$$\tan(A+B) = \frac{\tan A + \tan B}{1 - \tan A\tan B}$$

$$\tan(A-B) = \frac{\tan A - \tan B}{1 + \tan A\tan B}$$

– DOUBLE ANGLE FORMULA (NOT IN THE FORMULLA BOOKLET)

$$\sin 2A = 2\sin A\cos A$$

$$\cos 2A = \cos^2 A - \sin^2 A$$
$$= 2\cos^2 A - 1$$
$$= 1 - 2\sin^2 A$$

$$\tan 2A = \frac{2\tan A}{1 - \tan^2 A}$$

– $R\sin(x \pm \alpha)$ or $R\cos(x \mp \alpha)$

use addition formulae to simplify more complex trig expressions.

rewrite $3\sin x + 4\cos x$

in the form $R\sin(x+\alpha)$

WORKING OUT R

$$R = \sqrt{a^2 + b^2}$$

WORKING OUT α

$$\tan\alpha = \frac{b}{a}$$

which number is a and which is b ?

compare $3\sin x + 4\cos x$

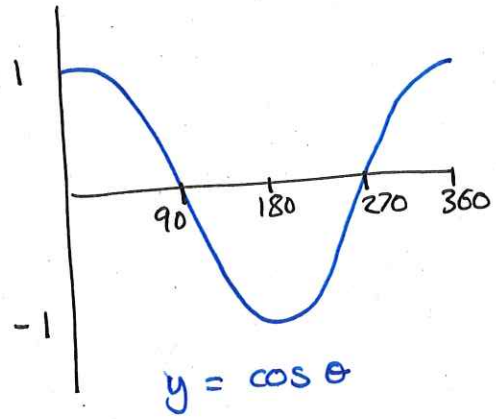
to addition formulae (use $\sin(\overset{A}{x}+\overset{B}{\alpha})$ in this case)

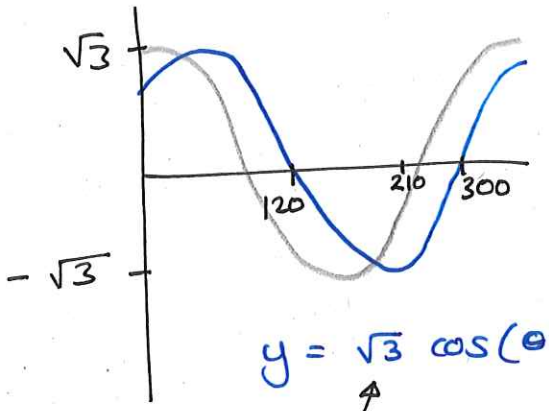
$$\sin x\cos\alpha + \cos x\sin\alpha$$

hence $\cos\alpha = 3$, $\sin\alpha = 4$ $\therefore$ $\tan\alpha = \frac{4}{3}$

- MAX AND MINS

$$y = \sqrt{3}\cos(\theta - 30^\circ)$$





$$y = 5 + \sqrt{3}\sin(\theta + 90^\circ)$$

shift up 5

max + min
max: $\sqrt{3} + 5$
min: $\sqrt{3} + 5$

shift left 90°