

Wave Equation

1. Express each of the following in the form

$$k \cos(x - \alpha) \quad \text{where } k > 0 \text{ and } 0 \leq \alpha^\circ \leq 360^\circ$$

a) $3\cos x + 2 \sin x$ b) $\cos x + \sin x$ c) $2\cos x + 4\sin x$

d) $5\cos x + 4 \sin x$ e) $\cos x + \sqrt{2}\sin x$ f) $\sqrt{3}\cos x + \sin x$

(i) Write down the maximum value of each of the above and the value of x at which this maximum occurs.

(ii) Write down the minimum value of each of the above and the value of x at which this minimum occurs.

2. Express each of the following in the form

$$k \cos(x + \alpha) \quad \text{where } k > 0 \text{ and } 0 \leq \alpha^\circ \leq 360^\circ$$

a) $2\cos x - \sin x$ b) $3\cos x - 2\sin x$ c) $6\cos x - \sin x$

d) $2\cos x - 2 \sin x$ e) $\cos x - \sqrt{2}\sin x$ f) $\sqrt{3}\cos x - 2\sin x$

(i) Write down the maximum value of each of the above and the value of x at which this maximum occurs.

(ii) Write down the minimum value of each of the above and the value of x at which this minimum occurs.

3. Express each of the following in the form

$$k \sin(x + \alpha) \quad \text{where } k > 0 \text{ and } 0 \leq \alpha^\circ \leq 360^\circ$$

a) $\cos x + \sin x$ b) $3\cos x + 5\sin x$ c) $4\cos x + \sin x$

d) $2\cos x + \sqrt{2} \sin x$ e) $7\cos x + 3\sin x$ f) $\sqrt{3}\cos x + 2\sin x$

(i) Write down the maximum value of each of the above and the value of x at which this maximum occurs.

(ii) Write down the minimum value of each of the above and the value of x at which this minimum occurs.

4. Express each of the following in the form

$$k \sin(x - \alpha) \quad \text{where } k > 0 \text{ and } 0 \leq \alpha^\circ \leq 360^\circ$$

a) $5\sin x - 3 \cos x$ b) $\sin x - \cos x$ c) $4\sin x - 2 \cos x$

d) $3\sin x - 7\cos x$ e) $-\cos x + 2\sin x$ f) $-\sqrt{3}\cos x + 3\sin x$

(i) Write down the maximum value of each of the above and the value of x at which this maximum occurs.

(ii) Write down the minimum value of each of the above and the value of x at which this minimum occurs.