1. Express each of the following as a single trigonometric function.
   (a) $\cos\theta + \sin\theta$ (b) $\sqrt{3}\cos\theta - \sin\theta$
   (c) $3\sin\theta + 4\cos\theta$ (d) $\sin\theta - \sqrt{2}\cos\theta$

2. Given that $\sqrt{3}\cos\theta + \sin\theta \equiv R\cos(\theta - \alpha)$, where $R > 0$ and α is acute, evaluate R and α.

3. Given that $5\sin\theta - 12\cos\theta \equiv R\sin(\theta - \alpha)$, where $R > 0$ and α is acute, evaluate R and α.

4. Find the maximum and minimum values of each of the following functions. [See page 58 of J11BA, RT]
   (a) $12\cos\theta - 5\sin\theta$ (b) $7\sin\theta + 24\cos\theta$
   (c) $2\sin\theta - 3\cos\theta$ (d) $(p + 1)\cos\theta + (p - 1)\sin\theta$

5. Find the maximum and minimum values of each of the following expressions and the corresponding values of θ, where $0° < \theta < 360°$.
   (a) $3\sin\theta - 4\cos\theta$ (b) $5\sin\theta + 12\cos\theta$
   (c) $\cos\theta - 3\sin\theta$ (d) $3\cos\theta + 2\sin\theta$
   (e) $4\sin\theta + 3\cos\theta - 2$ (f) $3 - 7\cos\theta + 24\sin\theta$

6. Find all the angles between 0° and 360° which satisfy the following equations.
   (a) $3\cos x - 4\sin x = 1$ (b) $\sqrt{3}\sin x - \cos x = 1$
   (c) $6\cos x - 2\sin x = 3.5$ (d) $\sin x + 2\cos x = \sqrt{2}$
   (e) $2.1\cos x - \sin x = 1.6$ (f) $\pi\cos x + e\sin x = 2$

7. Find all the angles between 0° and 180° inclusive which satisfy the following equations.
   (a) $\sin 2x = 2\cos 2x - 1$
   (b) $2\cos 3x - \sin 3x = 2$
   (c) $\dfrac{3\sin 2x}{1 + \cos 2x} = 2$

8. Solve the following equations for $0° < x < 360°$.
   (a) $\sin\frac{1}{2}x\cos\frac{1}{2}x + 2\cos x = 1$
   (b) $2\cot x = 3 + 2\operatorname{cosec} x$
   *(c) $2\sin x(2\sin x - \cos x) = 1$

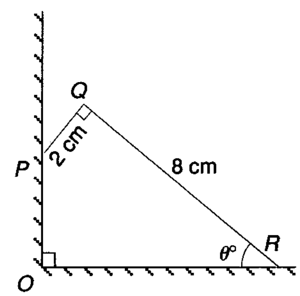
*9. Express $3\sin\theta + 4\cos(60° - \theta) = 2$ in the form $a\sin\theta + b\cos\theta = c$. Hence solve the given equation for values of θ between 0° and 360° inclusive.

***10.** The diagram shows an L-shape rod PQR leaning against a vertical wall. Given that $PQ = 2$ cm, $QR = 8$ cm and angle $ORQ = \theta°$, show that

$$OR = (2 \sin \theta° + 8 \cos \theta°) \text{ cm.}$$

(a) Find the value of θ for which OR is a maximum.

(b) Find the value of θ for which $OR = 6$ cm.



Exercise 11.3 *(p. 218)*

1. **(a)** $\sqrt{2} \cos (\theta - 45°)$ **(b)** $2 \cos (\theta + 30°)$ **(c)** $5 \sin (\theta + 53.1°)$
(d) $\sqrt{3} \sin (\theta - 54.7°)$

2. $R = 2$, $\alpha = 30°$

3. $R = 13$, $\alpha = 67.4°$

4. **(a)** 13, -13 **(b)** 25, -25 **(c)** $\sqrt{13}$, $-\sqrt{13}$ **(d)** $\sqrt{2p^2 + 2}$, $-\sqrt{2p^2 + 2}$

5. **(a)** max. = 5, $\theta = 143.1°$, min. = -5, $\theta = 323.1°$
(b) max. = 13, $\theta = 22.6°$, min. = -13, $\theta = 202.6°$
(c) max. = $\sqrt{10}$, $\theta = 288.4°$, min. = $-\sqrt{10}$, $\theta = 108.4°$
(d) max. = $\sqrt{13}$, $\theta = 33.7°$, min. = $-\sqrt{13}$, $\theta = 213.7°$
(e) max. = 3, $\theta = 53.1°$, min. = -7, $\theta = 233.1°$
(f) max. = 28, $\theta = 106.3°$, min. = -22, $\theta = 286.3°$

6. **(a)** 25.3°, 228.4° **(b)** 60°, 180° **(c)** 38.0°, 285.2°
(d) 77.3°, 335.8° **(e)** 21.1°, 288.0° **(f)** 102.1°, 339.6°

7. **(a)** 18.4°, 135° **(b)** 0°, 102.3°, 120° **(c)** 33.7°, 90°

8. **(a)** 75.0°, 313.1° **(b)** 247.4° **(c)** 45°, 161.6°, 225°, 341.6°

9. $(3 + 2\sqrt{3}) \sin \theta + 2 \cos \theta = 2$; 0°, 145.6°, 360°

10. **(a)** 14.0 **(b)** 57.4