5.4) Solving trigonometric equations

Worked example

Solve in the interval $0 \leq \theta \leq 2\pi$:

$$\cos\theta = \frac{1}{2}$$

$$\tan\theta = 1$$

Your turn

Solve in the interval $0 \leq \theta \leq 2\pi$:

$$\sin\theta = \frac{1}{2}$$

$$\theta = \frac{\pi}{6}, \frac{5\pi}{6}$$

Worked example

Solve in the interval $0 \leq \theta \leq 2\pi$:

$$\cos\theta + 1 = \frac{1}{2}$$

$$\tan\theta - 2 = 1$$

Your turn

Solve in the interval $0 \leq \theta \leq 2\pi$:

$$\sin\theta + 1 = \frac{1}{2}$$

$$\theta = \frac{7\pi}{6}, \frac{11\pi}{6}$$

Worked example

Solve in the interval $0 \leq \theta \leq 2\pi$:

$$5\cos\theta + 2 = 2.3$$

$$4\tan\theta - 5 = 1$$

Your turn

Solve in the interval $0 \leq \theta \leq 2\pi$:

$$3\sin\theta + 1 = 0.4$$

$\theta = 3.34, 6.08$ (3 sf)

Worked example

Solve in the interval $0 \leq \theta \leq 2\pi$:

$$\cos(\theta - \frac{\pi}{2}) = \frac{1}{2}$$

$$\tan(\theta + \frac{\pi}{3}) = 1$$

Your turn

Solve in the interval $0 \leq \theta \leq 2\pi$:

$$\sin(\theta - \frac{\pi}{4}) = \frac{1}{2}$$

$$\theta = \frac{5\pi}{12}, \frac{13\pi}{12}$$

Worked example

Solve in the interval $0 \leq \theta \leq 2\pi$:

$$\cos 5\theta = \frac{\sqrt{3}}{2}$$

$$\tan 4\theta = \sqrt{3}$$

Your turn

Solve in the interval $0 \leq \theta \leq 2\pi$:

$$\sin 3\theta = \frac{\sqrt{3}}{2}$$

$$\theta = \frac{\pi}{9}, \frac{2\pi}{9}, \frac{7\pi}{9}, \frac{8\pi}{9}, \frac{13\pi}{9}, \frac{14\pi}{9}$$

Worked example

Solve in the interval $0 \leq \theta \leq 2\pi$:

$$\cos^2\theta = \frac{3}{4}$$

$$\tan^2\theta = 3$$

Your turn

Solve in the interval $0 \leq \theta \leq 2\pi$:

$$\sin^2\theta = \frac{1}{4}$$

$$\theta = \frac{\pi}{6}, \frac{5\pi}{6}, \frac{7\pi}{6}, \frac{11\pi}{6}$$

Worked example

Solve in the interval $0 \leq \theta \leq 2\pi$:

$$2\cos^2\theta + 5\cos\theta - 3 = 0$$

$$2\tan^2\theta - 5\tan\theta - 3 = 0$$

Your turn

Solve in the interval $0 \leq \theta \leq 2\pi$:

$$2\sin^2\theta - 5\sin\theta - 3 = 0$$

$$\theta = \frac{7\pi}{6}, \frac{11\pi}{6}$$

Worked example

Solve in the interval $0 \leq \theta \leq 2\pi$:

$$5\cos^2\theta + 2\cos\theta = 0$$

$$4\tan^2\theta - 3\tan\theta = 0$$

Your turn

Solve in the interval $0 \leq \theta \leq 2\pi$:

$$5\sin^2\theta - 2\sin\theta = 0$$

$\theta = 0, 0.412, 2.73, \pi, 2\pi$

Worked example

Solve in the interval $0 \leq \theta \leq 2\pi$:

$$5\cos\theta \, sin\theta + 2\cos\theta = 0$$

Your turn

Solve in the interval $0 \leq \theta \leq 2\pi$:

$$5\cos\theta \, sin\theta + 2\sin\theta = 0$$

$$\theta = 0, 1.98, \pi, 4.30, 2\pi$$

Worked example

Solve in the interval $0 \leq \theta < 2\pi$:

$$4\tan x = 5\cos x$$

Your turn

Solve in the interval $0 \leq \theta < 2\pi$:

$$2\tan x = 3\sin x$$

$$\theta = 0, 0.841, \pi, 5.44$$

Worked example

Find all the solutions, in the interval $0 \leq x < 2\pi$, of the equation

$$2\sin^2 x + 1 = -5\cos x,$$

giving each solution in terms of π.

Your turn

Find all the solutions, in the interval $0 \leq x < 2\pi$, of the equation

$$2\cos^2 x + 1 = 5\sin x,$$

giving each solution in terms of π.

$$x = \frac{\pi}{6}, \frac{5\pi}{6}$$