

Solving Trig Equations

Given that $\cos(\theta - 20) = \cos 60$, which one of the following is a possible value of θ ?

40

140

280

320

Solve:

$$\sin 2\theta = 0.6 \quad 0 \leq \theta \leq 360$$

$$\cos 3\theta = 0.4 \quad 0 \leq \theta \leq 120$$

$$\tan \frac{\theta}{2} = 0.6 \quad 0 \leq \theta \leq 720$$

$$\sin 3\theta = (-0.2) \quad -120 \leq \theta \leq 120$$

$$\tan 2\theta = (-1) \quad 0 \leq \theta \leq 180$$

Solve:

$$\sin(\theta + 10) = 0.6 \quad 0 \leq \theta \leq 360$$

$$\sin(\theta + 30) = 0.1 \quad 0 \leq \theta \leq 360$$

$$\cos(\theta - 30) = 0.4 \quad -180 \leq \theta \leq 180$$

$$\tan(\theta + 50) = 2 \quad 360 \leq \theta \leq 720$$

$$\tan(\theta + 50) = 1 \quad 0 \leq \theta \leq 360$$

$$\cos(\theta + 50) = 1 \quad 180 \leq \theta < 310$$

Solve:

$$\sin(3\theta + 10) = 0.4 \quad 0 \leq \theta \leq 120$$

$$5\cos(2\theta - 30) = 4 \quad 0 \leq \theta \leq 360$$

$$\cos\left(2\theta - \frac{\pi}{2}\right) = -0.34 \quad 0 \leq \theta \leq 2\pi$$

Solve

$$2\sin^2\theta - 3\sin\theta + 1 = 0 \quad 0 \leq \theta \leq 2\pi$$

$$4\tan^2\theta - 7\tan\theta + 3 = 0 \quad 0 \leq \theta \leq 2\pi$$

$$2\cos^2\theta - \cos\theta = 0 \quad 0 \leq \theta \leq 360$$

Solve:

$$3\cos^2(2\theta + 1) - \cos(2\theta + 1) - 2 = 0 \quad 0 < \theta \leq \pi$$

$$4\tan^2(2\theta - 30) - 8\tan(2\theta - 30) + 3 = 0 \quad 0 < \theta \leq 180$$

Try this:

a) Show that $(2u + 3)(2u^2 - 3u - 1) = 4u^3 - 11u - 3$.

b) Hence solve the trig equation

$$4\tan^3 3(3\theta + 1) - 11\tan(3\theta + 1) - 3 = 0$$

giving all solutions in the range $0 \leq \theta \leq \frac{2\pi}{3}$

Solving Trig Equations - Answers

Given that $\cos(\theta - 20) = \cos 60$, which one of the following is a possible value of θ ?

40

140

280

320

Solve:

$$\sin 2\theta = 0.6$$

$$0 \leq \theta \leq 360$$

18.4, 71.6, 198.4, 251.6

$$\cos 3\theta = 0.4$$

$$0 \leq \theta \leq 120$$

22.1, 97.9

$$\tan \frac{\theta}{2} = 0.6$$

$$0 \leq \theta \leq 720$$

7.7, 52.7, 97.7, 142.7

$$\sin 3\theta = (-0.2)$$

$$-120 \leq \theta \leq 120$$

-56.2, -3.8, 63.8, 116.2

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

$$0 \leq \theta \leq 180$$

67.5, 157.5
(but not -45 or -22.5)

Solve:

$$\sin(\theta + 10) = 0.6$$

$$0 \leq \theta \leq 360$$

26.9, 133.1

$$\sin(\theta + 30) = 0.1$$

$$0 \leq \theta \leq 360$$

144.26, 335.74

$$\cos(\theta - 30) = 0.4$$

$$-180 \leq \theta \leq 180$$

-36.4, 96.4

$$\tan(\theta + 50) = 2$$

$$360 \leq \theta \leq 720$$

373.4, 553.4

$$\tan(\theta + 50) = 1$$

$$0 \leq \theta \leq 360$$

175, 355

$$\cos(\theta + 50) = 1$$

$$180 \leq \theta < 310$$

No solutions

Solve:

$$\sin(3\theta + 10) = 0.4$$

$$0 \leq \theta \leq 120$$

4.5 or 48.8

$$5\cos(2\theta - 30) = 4$$

$$0 \leq \theta \leq 360$$

33.5, 177, 213, 357

$$\cos\left(2\theta - \frac{\pi}{2}\right) = -0.34$$

$$0 \leq \theta \leq 2\pi$$

1.74, 2.97, 4.89, 6.11

Solve:

$$2\sin^2\theta - 3\sin\theta + 1 = 0 \quad 0 \leq \theta \leq 2\pi$$

$$4\tan^2\theta - 7\tan\theta + 3 = 0 \quad 0 \leq \theta \leq 2\pi \quad 0.644, 3.785, \pi/4, 5\pi/4$$

$$2\cos^2\theta - \cos\theta = 0 \quad 0 \leq \theta \leq 360 \quad 60, 90, 270, 300$$

Solve:

$$3\cos^2(2\theta + 1) - \cos(2\theta + 1) - 2 = 0 \quad 0 < \theta \leq \pi \quad 0.65, 1.49, 2.64$$

$$4\tan^2(2\theta - 30) - 8\tan(2\theta - 30) + 3 = 0 \quad 0 < \theta \leq 180 \quad 28.28, 43.16, 118.28, 133.16$$

Try this:

c) Show that $(2u + 3)(2u^2 - 3u - 1) = 4u^3 - 11u - 3$.

d) Hence solve the trig equation

$$4\tan^3 3(3\theta + 1) - 11\tan(3\theta + 1) - 3 = 0$$

giving all solutions in the range $0 \leq \theta \leq \frac{2\pi}{3}$

$$0.02, 0.39, 0.62, 1.07, 1.43, 1.67$$