

Trigonometry Lesson 10

Part One - Graphically Solving Equations

1) $20^\circ \pm n(120^\circ) \quad \frac{\pi}{9} \pm n\left(\frac{2\pi}{3}\right)$
 $40^\circ \pm n(120^\circ) \quad \frac{2\pi}{9} \pm n\left(\frac{2\pi}{3}\right)$

$\frac{\pi}{9}, \frac{2\pi}{9}$

6) $30^\circ \pm n(180^\circ) \quad \frac{\pi}{6} \pm n\pi$
 $150^\circ \pm n(180^\circ) \quad \frac{5\pi}{6} \pm n\pi$

2) $\pm n(180^\circ) \quad \pm n\pi$

7) $120^\circ \pm n(180^\circ) \quad \frac{2\pi}{3} \pm n\pi$

$\frac{2\pi}{3}, \frac{5\pi}{3}$

3) $\pm n(90^\circ) \quad \pm \frac{n\pi}{2}$

8) $480^\circ \pm n(720^\circ) \quad \frac{8\pi}{3} \pm n(4\pi)$
 $600^\circ \pm n(720^\circ) \quad \frac{10\pi}{3} \pm n(4\pi)$

$\frac{\pi}{2}, \pi$

4) $52.5^\circ \pm n(90^\circ) \quad \frac{7\pi}{24} \pm \frac{n\pi}{2}$
 $82.5^\circ \pm n(90^\circ) \quad \frac{11\pi}{24} \pm \frac{n\pi}{2}$

5) $30^\circ \pm n(90^\circ) \quad \frac{\pi}{6} \pm n\left(\frac{\pi}{2}\right)$

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

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Part Two - Linear Equations

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

2) $x = \frac{\pi}{6}, \frac{11\pi}{6}$

3) $x = \frac{3\pi}{2}$

$$2 \sin x \cos x - \cos x = 0$$

4) $\cos x(2 \sin x - 1) = 0$

$$x = \frac{\pi}{6}, \frac{\pi}{2}, \frac{5\pi}{6}, \frac{3\pi}{2}$$

$$\tan x = 1$$

5) $x = \frac{\pi}{4}, \frac{5\pi}{4}$

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

6) $x = \frac{\pi}{3}, \frac{5\pi}{3}$

$$\sin x \cos x (\tan x + 1) = 0$$

7) $x = 0, \frac{\pi}{2}, \frac{3\pi}{4}, \pi, \frac{3\pi}{2}, \frac{7\pi}{4}$

8) $x = \frac{\pi}{2}, \frac{2\pi}{3}, \frac{4\pi}{3}, \frac{3\pi}{2}$

9) $x = \frac{\pi}{4}, \frac{\pi}{2}, \pi, \frac{5\pi}{4}$

$$\cot x(\csc x + 1) = 0$$

10) $x = \frac{\pi}{2}, \frac{3\pi}{2}$

$$\cos x(\tan x + 1) = 0$$

11) $x = \frac{\pi}{2}, \frac{3\pi}{4}, \frac{3\pi}{2}, \frac{7\pi}{4}$

12) $x = 0, \frac{\pi}{4}, \frac{5\pi}{4}$

13) $\sec x(\cos x + 1) = 0$
 $x = \pi$

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

$$3 \sin x - 2 \sin x = 0$$

14) $\sin x = 0$

$$x = 0, \pi$$

$$6 \left(\frac{\tan x}{2} - \frac{\tan x}{3} \right) = 6 \left(\frac{-1}{6} \right)$$

15) $3 \tan x - 2 \tan x = -1$

$$\tan x = -1$$

$$x = \frac{3\pi}{4}, \frac{7\pi}{4}$$

16)

$$15 \left(\frac{\csc x}{5} + \frac{\csc x}{3} \right) = 15 \left(\frac{16}{15} \right)$$

$$3 \csc x + 5 \csc x = 16$$

$$8 \csc x = 16$$

$$\csc x = 2$$

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

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

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Part Three - Nonlinear Equations

ANSWERS:

1) $x = \frac{\pi}{6}, \frac{5\pi}{6}, \frac{7\pi}{6}, \frac{11\pi}{6}$

2) $x = \frac{\pi}{6}, \frac{5\pi}{6}, \frac{7\pi}{6}, \frac{11\pi}{6}$

3) $x = \frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}$

4) $x = \frac{\pi}{3}, \frac{2\pi}{3}, \frac{4\pi}{3}, \frac{5\pi}{3}$

$$(2\sin x + 1)(\sin x - 1) = 0$$

5) $x = \frac{\pi}{2}, \frac{7\pi}{6}, \frac{11\pi}{6}$

$$(2\sin x - 1)(\sin x + 1) = 0$$

6) $x = \frac{\pi}{6}, \frac{5\pi}{6}, \frac{3\pi}{2}$

$$3(2\cos^2 x - \cos x - 1) = 0$$

7) $3(2\cos x + 1)(\cos x - 1) = 0$
 $x = 0, \frac{2\pi}{3}, \frac{4\pi}{3}$

$$(2\sin x - 1)(\sin x - 1) = 0$$

8) $x = \frac{\pi}{6}, \frac{\pi}{2}, \frac{5\pi}{6}$

$$2(2\cos^2 x + \cos x - 1) = 0$$

9) $2(2\cos x - 1)(\cos x + 1) = 0$

$$x = \frac{\pi}{3}, \pi, \frac{5\pi}{3}$$

$$\cos x(2\cos^2 x + \cos x - 1) = 0$$

10) $\cos x(2\cos x - 1)(\cos x + 1) = 0$

$$x = \frac{\pi}{3}, \frac{\pi}{2}, \pi, \frac{3\pi}{2}, \frac{5\pi}{3}$$

$$\tan^2 x(\tan^2 x - 1) = 0$$

11) $\tan^2 x(\tan x + 1)(\tan x - 1) = 0$

$$x = 0, \frac{\pi}{4}, \frac{3\pi}{4}, \pi, \frac{5\pi}{4}, \frac{7\pi}{4}$$

$$\cos^4 x(\cos^4 x - 1) = 0$$

$$\cos^4 x(\cos^2 x + 1)(\cos^2 x - 1) = 0$$

12) $\cos^4 x(\cos^2 x + 1)(\cos x + 1)(\cos x - 1) = 0$

$$x = 0, \frac{\pi}{2}, \pi, \frac{3\pi}{2}$$