

Advanced Algebra

Assignment #13 Trig Equations

Solve the following Trig Equations:

1) $2\cos\theta - 1 = 0$

2) $3\tan\theta - \sqrt{3} = 0$

3) $\cos\theta - 1 = -\cos\theta$

4) $6\sin\theta = \sin\theta + 3$

5) $4\cos\theta = 2\cos\theta + 1$

6) $4\sin^2\theta - 2 = 0$

7) $9\tan^2\theta - 3 = 0$

8) $\sin\theta\cos\theta - 2\cos\theta = 0$

9) $\sqrt{2}\cos\theta\sin\theta - \cos\theta = 0$

10) $2\sin^2\theta - \sin\theta = 1$

11) $\csc\theta - 2 = 0$

12) $3\tan^3\theta - 3 = 0$

The following problems are "High Challenge Problems"

You might use the **Negative Angle Identities:**

$\sin(-x) = -\sin x$	$\cos(-x) = \cos x$	$\tan(-x) = -\tan x$
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Pythagorean Theorem Identities:

$\sin^2 x + \cos^2 x = 1$	$1 + \tan^2 x = \sec^2 x$	$1 + \cot^2 x = \csc^2 x$
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13) $\sin\theta = \sin(-\theta) + 1$

14) $0 = \cos^2 x - 5\cos x + 1$

15) $1 - \sin x = \sqrt{3}\cos x$

16) $\sqrt{\sin x} = 2\sin x - 1$

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① $2\cos\theta - 1 = 0$

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

$\theta = 60$

② $3\tan\theta - \sqrt{3} = 0$

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

$\theta = 30^\circ$

③ $\cos\theta - 1 = -\cos\theta$

$2\cos\theta = 1$

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

$\theta = 60$

④ $6\sin\theta = \sin\theta + 3$

$5\sin\theta = 3$

$\sin\theta = \frac{3}{5}$

$\sin^{-1}\left(\frac{3}{5}\right) = 36.9^\circ$

⑤ $4\cos\theta = 2\cos\theta + 1$

$2\cos\theta = 1$

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

$\theta = 60^\circ$

⑥ $4\sin^2\theta - 2 = 0$

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

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

$\theta = 45$

⑦ $9\tan^2\theta - 3 = 0$

$\tan^2\theta = \frac{3}{9}$

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

$\theta = 30^\circ$

⑧ $\sin\theta\cos\theta - 2\cos\theta = 0$

$\cos\theta(\sin\theta - 2) = 0$

$\cos\theta = 0$

$\theta = 90$

⑨

$\sqrt{2}\cos\theta\sin\theta - \cos\theta = 0$

$\cos\theta(\sqrt{2}\sin\theta - 1) = 0$

$\cos\theta = 0$ $\sin\theta = \frac{\sqrt{2}}{2}$

$\theta = 90$ $\theta = 45$

⑩ $2\sin^2\theta - \sin\theta = 1$

$2\sin^2\theta - \sin\theta - 1 = 0$

$(2\sin\theta + 1)(\sin\theta - 1)$

$\theta = 210$ 330 $\theta = 90^\circ$

⑪ $\csc\theta - 2 = 0$

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

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

$\theta = 30^\circ$

⑫ $3\tan^3\theta - 3 = 0$

$\tan^3\theta = 1$

$\theta = 45^\circ$

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$$(13) \sin \theta = \sin(-\theta) + 1$$

$$\sin \theta = -\sin \theta + 1$$

$$2\sin \theta = 1$$

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

$$\boxed{\theta = 30^\circ}$$

$$(14) \cos^2 \theta - 6\cos \theta + 5 = 0$$

$$(\cos \theta - 5)(\cos \theta - 1)$$

$$\boxed{\theta = 0, 360^\circ}$$

$$(15) 1 - \sin x = \sqrt{3} \cos x$$

↓
Square both
sides

$$1 - 2\sin x + \sin^2 x = 3\cos^2 x$$

$$\sin^2 x - 2\sin x + 1 = 3(1 - \sin^2 x)$$

$$\sin^2 x - 2\sin x + 1 = 3 - 3\sin^2 x$$

$$4\sin^2 x - 2\sin x - 2 = 0$$

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

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

$$\boxed{210^\circ \quad 90^\circ}$$

$$(16) \sqrt{\sin x} = 2\sin x - 1$$

$$\sin x = 4\sin^2 x - 4\sin x + 1$$

$$4\sin^2 x - 5\sin x + 1 = 0$$

$$(4\sin x - 1)(\sin x - 1)$$

$$\sin x = \frac{1}{4} \quad \sin x = 1$$

$$\sin^{-1}\left(\frac{1}{4}\right)$$

$$\boxed{14.5^\circ}$$

$$\boxed{90^\circ}$$