Identities

Identities to learn and quote.

Pythagorean

How would you use the first one to prove the other two?

$$\sin^2\theta + \cos^2\theta \equiv 1$$

$$1 + \cot^2\theta \equiv \operatorname{cosec}^2\theta$$

$$\tan^2\theta + 1 \equiv \sec^2\theta$$

Double Angle

How would you use the Compound Angle formulae in the formula book to prove these?

$$\sin 2\theta \equiv 2\sin\theta\cos\theta$$

$$\cos 2\theta \equiv \cos^2\theta - \sin^2\theta$$

$$\tan 2\theta \equiv \frac{2\tan\theta}{1-\tan^2\theta}$$

There a couple of other versions of $\cos 2\theta$. What are they?

Equation ladder

Solve each equation in the given domain. If you can't do one, move on.

(1) $\cos\theta = \frac{1}{2}, 0 \leqslant \theta \leqslant 2\pi$

(2) $\operatorname{cosec}\theta = 10, 0 \leqslant \theta < 360^\circ$

(3) $2\cos^2 x - 9\sin x + 3 = 0, -180^\circ \leqslant x \leqslant 180^\circ$

(4) $\tan^2 x = 5\sec x + 5, 0 \leqslant x < 2\pi$

(5) $3\cos 2\theta = 2 - 5\sin\theta, 0 \leqslant \theta < 360^\circ$

(6) $6\cos\theta - 3\sin\theta = 2, -\pi < \theta \leqslant \pi$

Answers

1. $\theta = \frac{\pi}{3}, \frac{5\pi}{3}$. (C2 Trigonometry: Trig Equations 1.)
2. $\theta = 5.74, 174.26$. (C3 Trigonometry: Reciprocal Trig Functions.)
3. $x = 30^\circ, 150^\circ$. (C2 Trigonometry: Trig Equations 2.)
4. $x = 1.40, \pi, 4.88$. (C3 Trigonometry: Reciprocal Trig Functions.)
5. $\theta = 90^\circ, 189.6^\circ, 350.4^\circ$. (C3 Trigonometry: Double Angle Formulae.)
6. $\theta = -1.73, 0.80$. (C3 Trigonometry: R-Alpha Method.)
7. All right? See C3 Trigonometry: Trig Review.