Trigonometry – Problems

1. Are the functions $y = \sin\theta$ and $y = \cos\theta$ defined for all angles $\theta \in \mathbb{R}$? Or are there values of θ where they do not exist? Explain.

2. Find all angles θ between 0 and 2π for which $\tan\theta$ is not defined. Explain your answer.

3. Find the acute angle that has the same sin-, cos-, and tan-values as $380°$, $-705°$, $1082°$, $\frac{13\pi}{6}$ radians, and -26π radians.

4. Convert the following angles to radians: $45°$, $-27°$, and $120°$.

5. Convert the following angles (given in radians) to degrees: 3π, $\frac{\pi}{12}$, and -2π.

6. A triangle has a $90°$ angle. The side facing that angle has length 5. One of the other angles is $30°$. Find the third angle, the cos-value of the third angle (using special triangles), and the length of the side adjacent to the third angle (using the previous two answers).

7. Find the angle θ between 0 and 2π such that $\cot\theta = \cot\frac{\pi}{4}$ but $\theta \neq \frac{\pi}{4}$.

8. Find all values of $\theta \in [0, 2\pi]$, such that:

    (a) $\sin^2\theta = \frac{1}{2}$

    (b) $(\cos\theta + 1)(2\cos\theta - 1) = 0$

    (c) $(4\cos^2\theta - 1)(\sin\theta - 2)(\cos\theta) = 0$

    (d) $\sin^2\theta + 2\sin\theta - 2 = 1$

9. Prove the following:

    (a) $\sin\theta \tan\theta = \sec\theta(1 - \cos^2\theta)$

    (b) $\tan\theta + \cot\theta = \sec\theta \csc\theta$

    (c) $\csc\theta \tan\theta \sec\theta = \tan^2\theta + 1$

    (d) $\sin\theta + (\sin\theta)(\cot^2\theta) = \csc\theta$