Thursday Night PreCalculus, February 8, 2024

Trigonometric Identities: Equations and Inequalities

Problems

1. (a) Find all the values of x that satisfy the equation $\sqrt{2}\cos(4x) + 1 = 0$

(b) Find all the values of x in the interval $0 \leq x \leq \pi$ that satisfy the equation $\sqrt{2}\cos(4x) + 1 < 0$

2. (a) Find all the values of x that satisfy the equation $\dfrac{1}{\sqrt{3}}\sin(2x) - \dfrac{1}{2} = 0$.

(b) Find all the values of x in the interval $0 \leq x \leq 2\pi$ that satisfy the equation $\sin(2x) \leq \cos x$.

3. What are all the values of θ, $0 \leq \theta \leq \pi$, for which $2\sin(2\theta) \geq 1$ and $2\cos\theta \geq 1$?

4. (a) Rewrite as an expression in which $\cos x$ appears once and no other trigonometric functions are involved.

$$\frac{1}{1 - \sin x} + \frac{1}{1 + \sin x}$$

(b) Rewrite as an expression in which $\sin x$ appears once and no other trigonometric functions are involved.

$$3\sin x - 4\sin^3 x$$

5. Suppose $\sin x = \dfrac{1}{3}$ and $\cos y = \dfrac{1}{4}$ where x and y are in the interval $(0, \pi/2)$. Evaluate the expression $\sin(x - y)$.

6. The function f is given by $f(x) = \cos(2.5x - 0.15)$. The function g is given by $g(x) = f(x - 0.5)$. What are the zeros of g on the interval $0 \leq x \leq \pi$?