Chapter 6 Investigation

Below are several investigation questions inspired by our work with trigonometric functions. Answer each question fully, showing work and giving written explanations with each problem. Spend at least thirty minutes working independently on the questions before you share your ideas with a friend. You may not use the internet (except Desmos!) as a resource. Partial credit will be given for ideas not necessarily leading to a complete solution.

1. Find each of the values exactly. (1 pt. each)

   a. $\cos\left(\sin^{-1}(1)\right)$ b. $\sin\left(\cos^{-1}\left(-\frac{\sqrt{3}}{2}\right)\right)$ c. $\tan\left(\cos^{-1}\left(\frac{3}{7}\right)\right)$

2. The angle θ lies in the first quadrant and $\cos\theta = 4/5$. Find $\cos(2\theta)$. Hint: draw a picture. (3 pts.)

3. Periodic functions come in all shapes and sizes as seen in the examples below. For a periodic function, the **period** is defined as the smallest positive a for which $f(x+a) = f(x)$. We saw that both the functions $\sin x$ and $\cos x$ have period of 2π, but their quotient $\tan x = \sin x \div \cos x$ has period of only π. Find functions as specified below or state why such functions do not exist. (2 pts. each)

   a. Functions $f(x)$ and $g(x)$ each with period 2π so that the function $h = f \div g$ has period 4π.

   b. Functions $f(x)$ and $g(x)$ each with period 2π so that the function $h = f \div g$ has period $\pi/2$.