CHALLENGE 5

1. If $P(t) = (a, b)$ is a trigonometric point, what are the coordinates of the trigonometric point $P(2t)$?

$P(2t) = (a^2 - b^2, 2ab)$

2. If $P(t) = (a, b)$ is a trigonometric point, what are the coordinates of the following trigonometric points?

a) $P(t + \pi)$ $(-a, -b)$ b) $P\left(t + \frac{\pi}{2}\right)$ $(-b, a)$

3. If $P(t) = (a, b)$ is a trigonometric point, determine

a) $\tan t$ $\frac{b}{a}$ b) $\operatorname{cotan} t$ $\frac{a}{b}$ c) $\sec t$ $\frac{1}{a}$ d) $\csc t$ $\frac{1}{b}$

4. Determine the exact coordinates of the following trigonometric points.

a) $P\left(\frac{25\pi}{6}\right)$ $\left(\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$ b) $P\left(-\frac{19\pi}{4}\right)$ $\left(\frac{-\sqrt{2}}{2}, \frac{-\sqrt{2}}{2}\right)$ c) $P\left(-\frac{16\pi}{3}\right)$ $\left(\frac{-1}{2}, \frac{\sqrt{3}}{2}\right)$

5. If $\tan t = \frac{12}{5}$ and $\pi \leq t \leq \frac{3\pi}{2}$, determine

a) $\sin t$ $\frac{-12}{13}$ b) $\cos t$ $\frac{-5}{13}$ c) $\sec t$ $\frac{-13}{5}$ d) $\csc t$ $\frac{-13}{12}$

6. Solve the equation $2 \sin \pi(x + 1) + 1 = 0$ in $\mathbb{R}$.

$S = \left\{\frac{-7}{6} + 2n\right\} \cup \left\{\frac{1}{6} + 2n\right\}$

7. Given the function $f(x) = -2 \cos \frac{\pi}{3}(x + 1) + 1$.

a) Determine

1. the amplitude of f. 2
2. the period of f. 6
3. the domain of f. $\mathbb{R}$
4. the range of f. $[-1, 3]$

b) Graph the function f in the Cartesian plane.

c) Determine in $\mathbb{R}$

1. the zeros of f. $\{0 + 6n\} \cup \{4 + 6n\}$
2. the sign of f. $f(x) \geq 0$ over $[6n, 4 + 6n]$; $f(x) \leq 0$ over $[-1 + 6n, 6n] \cup [4 + 6n, 5 + 6n]$
3. the variation of f. $f \nearrow$ over $[-1 + 6n, 2 + 6n]$; $f \searrow$ over $[2 + 6n, 5 + 6n]$

d) Determine over $[11, 17]$

1. the zeros of f. 12 and 16
2. the sign of f. $f(x) \geq 0$ over $[12, 16]$; $f(x) \leq 0$ over $[11, 12] \cup [16, 17]$
3. the variation of f. $f \nearrow$ over $[11, 14]$; $f \searrow$ over $[14, 17]$