INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES LYON

SCAN 1 — Quiz #1 — 10' *September 22, 2021*

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Exercise 1. Fill in the blank:

✓ $\cos\left(-\frac{46\pi}{3}\right) = \cos\left(\frac{-45\pi}{3} - \frac{\pi}{3}\right) = \cos\left(-15\pi - \frac{\pi}{3}\right) = \cos\left(-\pi - \frac{\pi}{3}\right) = \cos\left(\pi + \frac{\pi}{3}\right)$

$= -\cos\left(\frac{\pi}{3}\right) = -\frac{1}{2}$

Exercise 2. Let $n \in \mathbb{N}$. Simplify:

✓ $\frac{(2n+5)!}{(2n+3)!} = \frac{(2n+3)!\,(2n+4)(2n+5)}{(2n+3)!} = (2n+4)(2n+5)$

Exercise 3. Let $\theta \in \mathbb{R}$ such that $\cos(\theta) = 1/5$. Determine the value of $\cos(2\theta)$:

✓ $\cos(2\theta) = 2\cos^2(\theta) - 1 = 2 \times \left(\frac{1}{5}\right)^2 - 1 = \frac{2}{25} - 1 = \frac{-23}{25}$

Exercise 4. Let $x \in \mathbb{R}$. Fill in the blanks:

✓ $\sin(x) = \frac{1}{2} \iff \exists k \in \mathbb{Z},\ x = \frac{\pi}{6} + 2k\pi$ or $x = \pi - \frac{\pi}{6} + 2k\pi$

$\iff \exists k \in \mathbb{Z},\ x = \frac{\pi}{6} + 2k\pi$ or $x = \frac{5\pi}{6} + 2k\pi$

$\iff \sin(x) = \sin\left(\frac{\pi}{6}\right)$

Exercise 5. Let $u, v \in \mathbb{R}$. Fill in the blank with the addition (or subtraction) formula:

✓ $\cos(u+v) = \cos(u)\cos(v) - \sin(u)\sin(v)$

$\sin(u-v) = \sin(u)\cos(v) - \sin(v)\cos(u)$

Exercise 6. Let $s \in \mathbb{R}$. Recall the half-angle formula:

✓ $\sin^2(s) = \frac{1 - \cos(2s)}{2}$

Exercise 7. Fill in the blanks:

✓ $\cos\left(\frac{\pi}{3}\right) = \frac{1}{2}$ $\sin\left(\frac{\pi}{3}\right) = \frac{\sqrt{3}}{2}$ $\cos\left(\frac{\pi}{4}\right) = \frac{\sqrt{2}}{2}$

Exercise 8. Write the following expression with the $\sum$ symbol.

✓ $1^1 - 3^2 + 5^3 - 7^4 + 9^5 \cdots - 25^{12} = \sum_{k=1}^{12} (2k-1)^k (-1)^{k+1}$