

# The Weekly Rigor

No. 274

“A mathematician is a machine for turning coffee into theorems.”

September 21, 2019

## 12 Problems Solving Composite Trigonometric Equations (Type I) (Part 1)

Type I Equations: Involving sine or cosine.

### PROBLEMS

Solve for  $x$  over the interval  $[0, 2\pi)$ . Show (write out) the use of reference angles and the reference triangles to determine the solution(s), except in cases where  $x$  is a quadrant angle ( $0, \frac{\pi}{2}, \pi,$  and  $\frac{3\pi}{2}$ ).

1.  $4 \sin\left(\frac{1}{2}x\right) - 2 = 0$

2.  $4 \cos\left(\frac{1}{3}x\right) - \sqrt{12} = 0$

3.  $\sqrt{2} \sin(2x) + 1 = 0$

4.  $2 \sin(2x) - \sqrt{3} = 0$

5.  $2 \sin\left(\frac{3x}{2}\right) + \sqrt{3} = 0$

6.  $14 \cos\left(\frac{2x}{5}\right) - 7 = 0$

7.  $4 \cos\left(\frac{x}{2}\right) + 2 = 0$

8.  $2 \cos(3x) + \sqrt{2} = 0$

9.  $\sqrt{2}\sin(2x) - 1 = 0$

10.  $2 \sin\left(\frac{3x}{2}\right) - \sqrt{3} = 0$

11.  $2 \cos(3x) - 1 = 0$

12.  $\sin\left(\frac{x}{2}\right) - 1 = 0$

## ANSWERS

|  |   |
|--|---|
| 1. $\frac{\pi}{3}, \frac{5\pi}{3}$   | 2. $\frac{\pi}{2}$  |
| 3. $\frac{5\pi}{8}, \frac{7\pi}{8}, \frac{13\pi}{8}, \frac{15\pi}{8}$                                  | 4. $\frac{\pi}{6}, \frac{\pi}{3}, \frac{7\pi}{6}, \frac{4\pi}{3}$   |
| 5. $\frac{8\pi}{9}, \frac{10\pi}{9}$   | 6. $\frac{5\pi}{6}$   |
| 7. $\frac{4\pi}{3}$  | 8. $\frac{\pi}{4}, \frac{5\pi}{12}, \frac{11\pi}{12}, \frac{13\pi}{12}, \frac{17\pi}{12}, \frac{19\pi}{12}, \frac{21\pi}{12}$ |
| 9. $\frac{\pi}{8}, \frac{3\pi}{8}, \frac{9\pi}{8}, \frac{11\pi}{8}, \frac{13\pi}{8}, \frac{15\pi}{8}$  | 10. $\frac{2\pi}{9}, \frac{4\pi}{9}, \frac{14\pi}{9}, \frac{16\pi}{9}$  |
| 11. $\frac{\pi}{9}, \frac{5\pi}{9}, \frac{7\pi}{9}, \frac{11\pi}{9}, \frac{13\pi}{9}, \frac{17\pi}{9}$ | 12. $\pi$   |

“Only he who never plays, never loses.”