

# Math 1613 - Trigonometry

Quiz #18 - 2018.11.05

Solutions

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Find all angles  $\theta \in [0, 2\pi)$  such that  $\cos(3\theta) = \frac{\sqrt{3}}{2}$ . Hint: Remember that  $\cos(\pi/6) = \cos(-\pi/6) = \frac{\sqrt{3}}{2}$ .

Since we were given that  $\cos(\pi/6) = \cos(-\pi/6) = \frac{\sqrt{3}}{2}$ , we simply set :

$$3\theta = \frac{\pi}{6} + 2\pi k, \text{ or } 3\theta = -\frac{\pi}{6} + 2\pi k.$$

Solving for  $\theta$  in these gives:

$$\theta = \frac{\pi}{18} + \frac{2}{3}\pi k, \text{ or } \theta = -\frac{\pi}{18} + \frac{2}{3}\pi k$$

Obtaining a common denominator yields

$$\theta = \frac{\pi + 12\pi k}{18}, \text{ or } \theta = \frac{-\pi + 12\pi k}{18}$$

We simply need all values of  $k$  for which  $\theta \in [0, 2\pi)$ . For the first piece, they are  $k = 0, 1, 2$ , and for the second it is  $k = 1, 2, 3$ . So

$$\theta = \frac{\pi}{18}, \frac{13\pi}{18}, \frac{25\pi}{18}, \frac{11\pi}{18}, \frac{23\pi}{18}, \frac{35\pi}{18}$$