

PRECALC Class ex. Sec. 6.7 + 6.8: Trig Equations I and II

- 1) Given $\sin \theta = \frac{1}{2}$ a) Is $\theta = \frac{\pi}{6}$ a solution? yes b) Is $\theta = \frac{\pi}{4}$ a solution? NO

$$\sin \frac{\pi}{6} = \frac{1}{2}$$

$$\sin \frac{\pi}{4} = \frac{\sqrt{2}}{2}$$

- 2) Solve the equation $\cos \theta = \frac{1}{2}$ and give a general formula for all solutions.

The period of $\cos = 2\pi$, so start by finding solutions in $[0, 2\pi)$

$$\theta = \frac{\pi}{3} + 2\pi k, \frac{5\pi}{3} + 2\pi k$$

List eight solutions.

$$\frac{-5\pi}{3}, \frac{-\pi}{3}, \frac{\pi}{3}, \frac{5\pi}{3}, \frac{7\pi}{3}, \frac{11\pi}{3}, \frac{13\pi}{3}, \frac{17\pi}{3}$$

$k = -1 \quad k = 0 \quad k = 1 \quad k = 2$

- 3) Solve each equation over the interval $0 \leq \theta < 2\pi$.

a) $2\sin \theta + \sqrt{3} = 0$

$$\theta = \frac{4\pi}{3}, \frac{5\pi}{3}$$

b) $\sin(2\theta) = \frac{1}{2}$

$$\theta = \frac{\pi}{12}, \frac{5\pi}{12}, \frac{13\pi}{12}, \frac{17\pi}{12}$$

c) $\tan(\theta - \frac{\pi}{2}) = 1$

$$\theta = \frac{3\pi}{4}, \frac{7\pi}{4}$$

d) $2\sin^2 \theta - 3\sin \theta + 1 = 0$

$$\theta = \frac{\pi}{6}, \frac{5\pi}{6}, \frac{\pi}{2}$$

- 1) let $u = \sin \theta \rightarrow 2u^2 - 3u + 1 = 0$
- 2) Factor
- 3) substitute back in for u
- 4) solve

e) $3\cos \theta + 3 = 2\sin^2 \theta$

$$2\sin^2 \theta - 3\cos \theta - 3 = 0 \quad -2\cos^2 \theta - 3\cos \theta - 1 = 0$$

$$2(1 - \cos^2 \theta) - 3\cos \theta - 3 = 0 \quad -2\cos^2 \theta - 3\cos \theta - 1 = 0$$

$$2 - 2\cos^2 \theta - 3\cos \theta - 3 = 0 \quad 2\cos^2 \theta + 3\cos \theta + 1 = 0$$

$$-2\cos^2 \theta - 3\cos \theta - 1 = 0 \quad 2u^2 + 3u + 1 = 0$$

$$(2u+1)(u+1) = 0$$

$$(2\cos \theta + 1)(\cos \theta + 1) = 0$$

$$\cos \theta = -\frac{1}{2} \quad \cos \theta = -1$$

$$\theta = \frac{2\pi}{3}, \frac{4\pi}{3} \quad \theta = \pi$$

- f) $\sin \theta = .3$ by using your calculator. Express solutions in radians rounded to two decimal places.

$$\theta = \sin^{-1}(0.3) = \boxed{.30 \text{ rad}}$$

*look for a second solution



$$\theta = \pi - 0.3 \approx \boxed{2.84 \text{ rad}}$$