## MATH 11022: Trigonometric Equations

**Example 1:** Consider the equation  $\sin \theta = \frac{\sqrt{3}}{2}$ .

- (a) Is  $\theta = 60^{\circ}$  a solution of this equation?
- (b) Is  $\theta = 420^{\circ}$  a solution of this equation?
- (c) Is  $\theta = 780^{\circ}$  a solution of this equation?
- (d) Is  $\theta = -300^{\circ}$  a solution of this equation?
- (e) Is  $\theta = -660^{\circ}$  a solution of this equation?

**Result.** Trigonometric equations have an infinite number of solutions: the solutions between  $0^{\circ}$  and  $360^{\circ}$ , and any multiple of  $360^{\circ}$  added to these solution.

**Example 2:** Solve for  $\theta$  (give all solutions):  $\sin \theta = \frac{\sqrt{3}}{2}$ 

**Example 3:** Solve for  $\theta$ ,  $0^{\circ} \le \theta < 360^{\circ}$ :  $\cos \theta = -\frac{1}{2}$ 

**Example 4:** Solve for  $\theta$ . Give all solutions AND those for which  $0^{\circ} \leq \theta < 360^{\circ}$ :

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

(b)  $\tan \theta = -1$ 

(c)  $\sec \theta = -2$ 

(d)  $\sin \theta = 1$ 

(e)  $\cos \theta = 0$ 

**Example 5:** Use your calculator to solve for  $\theta$ ,  $0^{\circ} \le \theta < 360^{\circ}$ . Give answers to two decimal places:

(a)  $\sin \theta = 0.7$ 

(b)  $\tan \theta = 5$ 

(c)  $\cos \theta = 0.34$ 

(d)  $\sin \theta = -0.225$ 

(e)  $\tan \theta = -11.5$ 

(f)  $\cos \theta = -0.511$ 

**Example 6:** Solve for  $\theta$ ,  $0^{\circ} \le \theta < 360^{\circ}$ :

(a) 
$$\tan(2\theta) = \frac{1}{\sqrt{3}}$$

(b) 
$$\sin(3\theta) = \frac{\sqrt{3}}{2}$$

(c) 
$$\sec(5\theta) = -\sqrt{2}$$

**Example7:** Solve each equation. If the variable is  $\theta$ , find all solutions for which  $0^{\circ} \le \theta < 360^{\circ}$ . If the variable is x, find all solutions for which  $0 \le x < 2\pi$ .

(a)  $2\sin\theta + 1 = 0$ 

(b)  $4 \sec x + 8 = 0$ 

(c)  $2\sin(3\theta) - \sqrt{3} = 0$ 

(d)  $\cos(4x) = 1$ 

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

(f)  $\sin x \cos x - \sin x = 0$ 

(g)  $\sin x \tan x = \sin x$ 

(h)  $2\cos^2 x + \cos x - 1 = 0$ 

(i)  $4\sin^2\theta - 5\sin\theta + 1 = 0$ 

(j)  $\sin^2 \theta - \cos^2 \theta + \cos \theta = 0$ 

(k)  $\sec^2 x + \tan^2 x = 3$ 

(l)  $4\sin x = \csc x$ 

(m)  $\cos\theta - \cot\theta = 0$ 

(n)  $\tan x - \cot x = 0$ 

(o)  $\sin x = \cos x$ 

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(p)  $\sin x + \cos x = 0$ 

 $(q) \quad \sin(2x) - \cos x = 0$ 

(r)  $\cos^2 x - \sin^2 x = 1$ 

(s)  $\sec \theta - \tan \theta - \cos \theta = 0$ 

(t)  $\cos x + 1 = \sin x$