

## Linear Trigonometric Equations

These notes are intended as a supplement of section 7.1 and 7.2 (p. 572 – 600) in your workbook. You should also read the section for more complete explanations and additional examples.

### Trigonometric Equations

A trigonometric equation is any equation that contains a trigonometric function. For example:

$$2 \cos x + 1 = 0$$

$$4 \cos x + 3 = 7 \cos x + 2$$

$$\sqrt{2} \sin x - 3 = -2$$

Trigonometric equations are solved in virtually the same manner as any other equation. The trigonometric function is treated like a variable (like  $x$  or  $y$ ) until it is isolated. Then,  $x$  can be solved for using the inverse trigonometric functions (as was done in chapter 6).

**Note:** When solving trigonometric equations, you should find exact values whenever possible.

### Solving Linear Trigonometric Equations

Solve the following linear equation for  $x$ :

$$5x + 7 = 3x + 8$$

Now solve the following linear trigonometric equation for  $x$ , where  $0 \leq x \leq 2\pi$ :

$$5 \sin x + 7 = 3 \sin x + 8$$

Notice that the procedure is the same until the final step. Let's try a few more examples.

**Example 1**

Solve the equation  $\sin x - 1 = 0$  for all values of  $x$  in the interval  $0 \leq x \leq 2\pi$ .

**Example 2**

Solve the equation  $2\cos x + \sqrt{3} = 0$  for all values of  $x$  in the interval  $0 \leq x \leq 2\pi$ .

**Example 3**

Solve the equation  $\frac{\sec x}{2} + 1 = 0$  for all values of  $x$  in the interval  $0 \leq x \leq 2\pi$ .

**Example 4**

Solve the equation  $5 + 3\sin x = 6$  for all values of  $x$  in the interval  $0 \leq x \leq 2\pi$ .

**Example 5**

Solve the equation  $3\cot x + 5 = -7$  for all values of  $x$  in the interval  $0 \leq x \leq 2\pi$ .

**Homework:** Supplemental Worksheet #2

## Supplemental Worksheet #2

1. Solve the following equations over the interval  $0^\circ \leq x \leq 360^\circ$ .

a)  $2 \cos x = 2$

b)  $5 \tan x + 4 = 0$

c)  $4 \tan x - 7 = 5 \tan x - 6$

2. Solve the following equations over the interval  $0 \leq x \leq 2\pi$ .

a)  $\tan x + \sqrt{3} = 0$

b)  $2 \tan x + 2\sqrt{3} = 0$

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

3. Solve the equation  $2 \sin x + \sqrt{2} = 0$  over the interval  $\frac{\pi}{2} \leq x \leq \frac{3\pi}{2}$ .

4. Determine the exact value for the expression  $\sin \frac{2\pi}{3} \cdot \cos \frac{7\pi}{6} \cdot \tan \left( \frac{-3\pi}{4} \right)$ .

5. Given  $P(27\pi)$  is a point on the unit circle, find the quadrant and the coordinates of the point  $P$ .

6. If  $P(x)$  lies on the line segment joining the origin and the point  $(-6, -8)$  find  $\cos x$ .