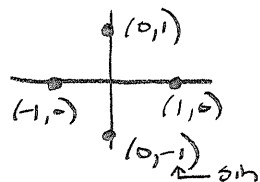


## Section 2.6 Examples

### Example 1

a) Find the domain values of the sine function,  $-2\pi \leq x \leq 2\pi$ , that have a range value of -1. That is, find  $x$  such that  $\sin x = -1$ . *Unit Circle*  $\begin{pmatrix} \cos & -1 \\ & \sin \end{pmatrix}$

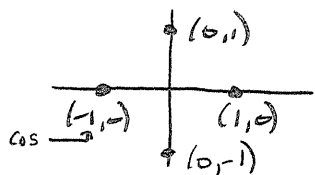


$$x = \frac{3\pi}{2}, -\frac{\pi}{2}$$

$$\sin^{-1}(-1) = -90^\circ \text{ (Deg)}$$

$$\sin^{-1}(-1) = -1.57... \text{ (Rad)}$$

b) Find the domain values of the cosine function,  $-2\pi \leq x \leq 2\pi$ , that have a range value of -1. That is, find  $x$  such that  $\cos x = -1$ .



$$x = \pi, -\pi$$

$$\cos^{-1}(-1) = 180^\circ \text{ (Deg)}$$

$$\cos^{-1}(-1) = 3.14... \text{ (Rad)}$$

Example 2: If  $\cos x = 0.5$ , what is the value of each of the following. *Every  $2\pi, -2\pi, 360^\circ, -360^\circ$  rotation lands in the same spot on the unit circle.*

|                    |                    |                     |                     |
|--------------------|--------------------|---------------------|---------------------|
| a) $\cos(x+2\pi)$  | b) $\cos(x-2\pi)$  | c) $\cos(x+18\pi)$  | d) $\cos(x-34\pi)$  |
| $\cos(1.047+2\pi)$ | $\cos(1.047-2\pi)$ | $\cos(1.047+18\pi)$ | $\cos(1.047-34\pi)$ |
| $= 0.5$            | $= 0.5$            | $= 0.5$             | $= 0.5$             |

$$\cos^{-1}(0.5) = 60^\circ \text{ (Deg)} \quad \cos^{-1}(0.5) = 1.047 \text{ rad}$$

What can we conclude from the results in example 2?

- For every value of  $x$ , we can add or subtract an integer multiple of  $2\pi$  or  $360^\circ$  and return to the same point on the unit circle
- Same value repeats every  $2\pi$  or  $-2\pi$  ( $360^\circ$  or  $-360^\circ$ )

Example 3: Simplify each expression using the fundamental identities:

a)  $\frac{\sin^2 x + \cos^2 x}{\tan x} = \frac{1}{\tan x}$

$$= \boxed{\cot x}$$

b)  $\frac{\sin(-x)}{\cos(-x)} = \frac{-\sin x}{\cos x}$

$$= \boxed{-\tan x}$$

c)  $\frac{1 - \cos^2 x}{\sin^3 x} = \frac{\sin^2 x}{\sin^3 x}$

$$= \frac{1}{\sin x}$$

$$= \boxed{\csc x}$$

d)  $\tan(-x)\cos(-x)$

$$= -\tan x \cdot \cos x$$

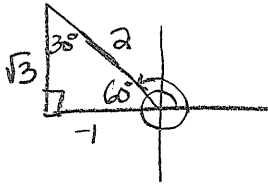
$$= \frac{-\sin x}{\cos x} \cdot \cos x$$

$$= \boxed{-\sin x}$$

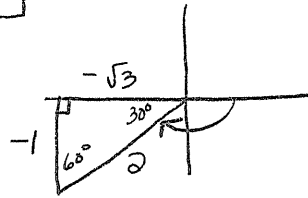
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Example 4: Find each exactly.

a)  $\frac{1}{4} \sin \frac{8\pi}{3} \quad 480^\circ = \boxed{\frac{\sqrt{3}}{2}}$

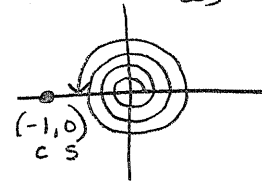


b)  $\frac{1}{A} \sec \frac{-5\pi}{6} \quad -150^\circ = -\frac{2 \cdot \sqrt{3}}{\sqrt{3} \cdot \sqrt{3}}$



$= \boxed{\frac{-2\sqrt{3}}{3}}$

c)  $\tan 7\pi \quad \frac{\sin}{\cos} = \frac{0}{-1} = \boxed{0}$



Example 5: Evaluate to 4 significant digits

a)  $\sin(-13.72) \text{ Rad}$       b)  $\sec 22.33 \text{ Rad}$       c)  $\cos(505.3) \text{ Rad}$

$\boxed{-0.9142}$

$\frac{1}{\cos 22.33} = \boxed{-1.060}$

$\boxed{-0.8793}$

Example 6: Evaluate  $\sin x$  to two significant digits for:

a)  $x = -3.2$

b)  $x = -3.2 + 2\pi$

c)  $x = -3.2 - 2\pi$

Radian Mode

d)  $x = -3.2 + 22\pi$

$\sin(-3.2)$

$\boxed{= 0.058}$

$\sin(-3.2 + 2\pi)$

$\boxed{= 0.058}$

$\sin(-3.2 - 2\pi)$

$\boxed{= 0.058}$

$\sin(-3.2 + 22\pi)$

$\boxed{= 0.058}$