WARM UP

- Find the **exact value:**

$$\sin\frac{7\pi}{6} \qquad\qquad \cos\frac{3\pi}{4} \qquad\qquad \tan\frac{4\pi}{3}$$

Homework answers

1. $\frac{\sqrt{6}-\sqrt{2}}{4}$
2. $\frac{\sqrt{2}+\sqrt{6}}{4}$
3. $2-\sqrt{3}$
4. $\frac{\sqrt{6}+\sqrt{2}}{4}$
5. $2-\sqrt{3}$
6. $\frac{\sqrt{2}-\sqrt{6}}{4}$
7. $-2-\sqrt{3}$
8. $\frac{-\sqrt{6}-\sqrt{2}}{4}$
9. $-2-\sqrt{3}$

Homework Check

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Find $\cos\left(x - \frac{\pi}{2}\right)$.

$$\cos\left(x - \frac{\pi}{2}\right) = \cos x \cos \frac{\pi}{2} + \sin x \sin \frac{\pi}{2}$$

$$= (\cos x)(0) + (\sin x)(1)$$

$$= \sin x$$

Some for you to try

Find $\sin(\pi - y)$.

Some for you to try

$$\cos\left(\frac{\pi}{2} - x\right) =$$

$$\sin\left(\frac{\pi}{2} - x\right) =$$

$$\tan\left(\frac{\pi}{2} - x\right) =$$

Cofunction Identities

$$\sin x = \cos\left(\frac{\pi}{2} - x\right) \qquad \cos x = \sin\left(\frac{\pi}{2} - x\right)$$

$$\tan x = \cot\left(\frac{\pi}{2} - x\right) \qquad \cot x = \tan\left(\frac{\pi}{2} - x\right)$$

$$\sec x = \csc\left(\frac{\pi}{2} - x\right) \qquad \csc x = \sec\left(\frac{\pi}{2} - x\right)$$

Applications:

If $\sin x = \frac{2}{3}$ and $\frac{\pi}{2} < x < \pi$, then $\sin(\frac{\pi}{3} + x) = ?$

Step 1. Find **cos x** or **sin x** using Pythagorean identity. Use the quadrant given to decide what the correct sign is.

Step 2. Use the addition and subtracting identities to write an equivalent form .

Step 3. Use the values given , and the one found in step 1 to find your answer.

If $\sin x = \frac{2}{3}$ and $\frac{\pi}{2} < x < \pi$, then $\sin(\frac{\pi}{3} + x) = ?$

Step 1. Find **cos x** or **sin x** using Pythagorean identity. Use the quadrant given to decide what the correct sign is.

$$\sin^2 x + \cos^2 x = 1$$

$$\left(\frac{2}{3}\right)^2 + \cos^2 x = 1$$

$$\frac{4}{9} + \cos^2 x = 1$$

$$\cos^2 x = 1 - \frac{4}{9} = \frac{9}{9} - \frac{4}{9} = \frac{5}{9}$$

$$\cos x = \pm\sqrt{\frac{5}{9}} = \pm\frac{\sqrt{5}}{3}$$

Since $\frac{\pi}{2} < x < \pi$, which is 2nd quadrant, $\cos x$ must be negative.

Therefore, $\cos x = -\frac{\sqrt{5}}{3}$

If $\sin x = \frac{2}{3}$ and $\frac{\pi}{2} < x < \pi$, then $\sin(\frac{\pi}{3} + x) = ?$

Step 2. Use the addition and subtracting identities to write an equivalent form .

$$sin\left(\frac{\pi}{3} + x\right) = sin\frac{\pi}{3}cosx + cos\frac{\pi}{3}sinx$$

Step 3. Use the values given, and the one found in step 1 to find your answer.

$$\frac{\sqrt{3}}{2}\left(\frac{-\sqrt{5}}{3}\right) + \frac{1}{2}\left(\frac{2}{3}\right) = \frac{-\sqrt{15}}{6} + \frac{2}{6} = \frac{-\sqrt{15} + 2}{6}$$

One for you to try:

If $\cos x = \frac{-1}{3}$ and $\pi < x < \frac{3\pi}{2}$, then $\sin(\frac{\pi}{4} + x) = ?$

Daily Practice

- P.587 #13-18, 25-34