

Pythagorean Identity
Springboard 33.1
5.3.17

Warm-up

Simplify

1) $-\left(\frac{4\sqrt{2}}{8}\right)^2$

2) $-\left(\frac{5\sqrt{3}}{10}\right)^2$

3) Given $\cos\theta = -\frac{3}{5}$ and $\frac{\pi}{2} < \theta < \pi$.

Solve for $\sin\theta$ and $\tan\theta$

Pythagorean Identity
 $(\sin\theta)^2 + (\cos\theta)^2 = 1$

can also be written as
 $\sin^2 \theta + \cos^2 \theta = 1$

$$\tan\theta = \frac{\sin\theta}{\cos\theta}$$

I do:

$$\text{Given } \cos\theta = -\frac{3}{5} \text{ and } \frac{\pi}{2} < \theta < \pi.$$

Solve for $\sin\theta$ and $\tan\theta$ using the Pythagorean identity.

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| Plug given into Pythagorean identity $\sin^2 \theta + \cos^2 \theta = 1$ | $\sin^2 \theta + \left(-\frac{3}{5}\right)^2 = 1$ |
| Simplify | $\sin^2 \theta + \frac{9}{25} = 1$ |
| Solve for missing part | $\sin^2 \theta = 1 - \frac{9}{25}$ $\sin^2 \theta = \frac{16}{25}$ $\sin\theta = \sqrt{\frac{16}{25}}$ $\sin\theta = \pm \frac{4}{5}$ |
| Determine which quadrant the θ is in to see if it is positive or negative | Quadrant 2 sine is positive $\sin\theta = \frac{4}{5}$ |
| Solve for $\tan\theta$ $\tan\theta = \frac{\sin\theta}{\cos\theta}$ | $\tan\theta = \frac{\frac{4}{5}}{-\frac{3}{5}}$ $\tan\theta = \frac{4}{5} \cdot -\frac{5}{3} = -\frac{4}{3}$ |

We do:

Given $\sin\theta = -\frac{\sqrt{3}}{2}$ and $\pi < \theta < \frac{3\pi}{2}$.

Solve for $\cos\theta$ and $\tan\theta$ using the Pythagorean identity.

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|---|--|
| Plug given into Pythagorean identity $\sin^2 \theta + \cos^2 \theta = 1$ | |
| Simplify | |
| Solve for missing part | |
| Determine which quadrant the θ is in to see if it is positive or negative | |
| Solve for $\tan\theta$ $\tan\theta = \frac{\sin\theta}{\cos\theta}$ | |

Given $\sin\theta = -\frac{4\sqrt{2}}{8}$ and $\frac{3\pi}{2} < \theta < 2\pi$.
 Solve for $\cos\theta$ and $\tan\theta$ using the Pythagorean identity.

| | |
|---|--|
| Plug given into Pythagorean identity $\sin^2 \theta + \cos^2 \theta = 1$ | |
| Simplify | |
| Solve for missing part | |
| Determine which quadrant the θ is in to see if it is positive or negative | |
| Solve for $\tan\theta$ $\tan\theta = \frac{\sin\theta}{\cos\theta}$ | |

You do:

Given $\sin\theta = -\frac{4\sqrt{2}}{8}$ and $\frac{3\pi}{2} < \theta < 2\pi$.
solve for $\cos\theta$ and $\tan\theta$