

Solutions

6.1 Fundamental Identities

6.1.1. Simplify $\sec^2 x - \tan^2 x$.

Solution. The identity $1 + \tan^2 x = \sec^2 x$ gives 1, with $\cos x \neq 0$ retained.

6.1.2. If $\sin x = 3/5$ and x is in quadrant II, find cosine.

Solution. $\cos^2 x = 1 - 9/25 = 16/25$. Quadrant II gives $\cos x = -4/5$.

6.1.3. Show that $\tan x \cos x = \sin x$ and state the original restriction.

Solution. Replace tangent by $\sin x / \cos x$ and cancel. The original expression requires $\cos x \neq 0$.

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6.2 Angle Sum and Double-Angle Identities

6.2.1. Find $\cos(\pi/12)$ exactly.

Solution. Use the difference formula: $\cos(\pi/4 - \pi/6) = \sqrt{6}/4 + \sqrt{2}/4$.

6.2.2. If $\sin x = 3/5$, find $\cos(2x)$.

Solution. $1 - 2\sin^2 x = 1 - 18/25 = 7/25$, regardless of which allowed quadrant contains x .

6.2.3. Explain why $\sin(a + b) = \sin a + \sin b$ is false.

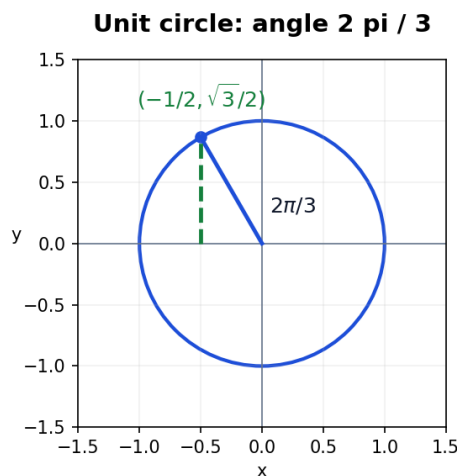
Solution. Take $a = b = \pi/2$. The left side is 0, but the right side is 2.

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6.3 Solving Trigonometric Equations

6.3.1. Solve $\sin x = \sqrt{3}/2$ on $[0, 2\pi)$.

Solution. The reference angle is $\pi/3$. Sine is positive in quadrants I and II: $x = \pi/3, 2\pi/3$.



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The terminal point is $(-1/2, \sqrt{3}/2)$; tangent is $-\sqrt{3}$.

6.3.2. Solve $\sin x \cos x = 0$ on $[0, 2\pi)$.

Solution. Use the zero-product property. The solutions are $0, \pi/2, \pi, 3\pi/2$.

6.3.3. Give all real solutions to $\tan x = 1$.

Solution. Tangent has period π , so $x = \pi/4 + k\pi$ for any integer k .