

Write as the function of one angle. Simplify, if possible, without using a calculator.

1. $1 - 2 \sin^2 15^\circ$

$$\cos(2 \cdot 15) = \cos(30) = \frac{\sqrt{3}}{2}$$

If $\sin A = \frac{3}{5}$ and A is in the first quadrant, find each value.

3. $\cos(2A) = \cos^2(A) - \sin^2(A)$

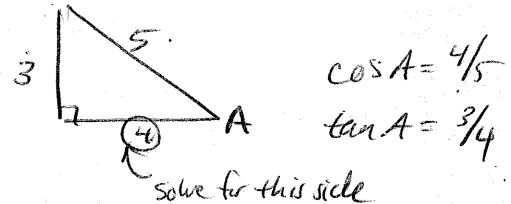
$$= \left(\frac{4}{5}\right)^2 - \left(\frac{3}{5}\right)^2$$

$$= \frac{16}{25} - \frac{9}{25} = \frac{7}{25}$$

4. $\tan(2A)$

$$\frac{2 \tan A}{1 - \tan^2 A}$$

$$= \frac{2 \cdot (3/4)}{1 - (3/4)^2} = \frac{3/2}{1 - 9/16} = \frac{3/2}{7/16} = \frac{3}{2} \cdot \frac{16}{7} = \frac{24}{7}$$



5. $\sin(2A)$

$$2 \sin A \cos A$$

$$2 \left(\frac{3}{5}\right) \left(\frac{4}{5}\right)$$

$$\frac{6}{5} \cdot \frac{4}{5} = \frac{24}{25}$$

If $\tan y = \frac{5}{12}$ and y is in the third quadrant, find each value.

makes sine of cosine negative!

6. $\sin 2y$

$$2 \sin y \cos y$$

$$2 \left(-\frac{5}{13}\right) \left(-\frac{12}{13}\right) = \frac{120}{169}$$

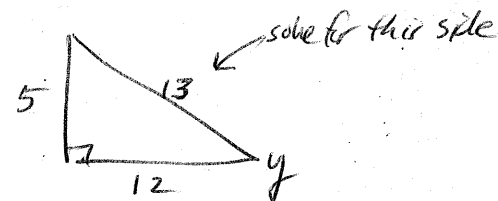
7. $\tan 2y$

$$\frac{2 \tan y}{1 - \tan^2 y}$$

$$\frac{2 \left(5/12\right)}{1 - \left(5/12\right)^2} = \frac{5/6}{1 - \frac{25}{144}}$$

$$= \frac{5}{6} \cdot \frac{144}{119}$$

$$= \frac{120}{119}$$



$$\sin y = -\frac{5}{13}$$

$$\cos y = -\frac{12}{13}$$

8. $\cos 2y$

$$\cos^2 y - \sin^2 y$$

$$\left(-\frac{12}{13}\right)^2 - \left(-\frac{5}{13}\right)^2$$

$$\frac{144}{169} - \frac{25}{169}$$

$$\frac{119}{169}$$

Verify that each of the following is an identity.

$$9. \sin(2A) = \frac{2 \tan(A)}{1 + \tan^2(A)}$$

$$\begin{aligned} \frac{2 \sin(A) \cos(A)}{\sec^2(A)} &= \frac{2 \tan(A)}{1 + \tan^2(A)} \\ &= \frac{2 \sin(A)}{\cos(A)} \cdot \frac{\cos(A)}{1} \\ &= \frac{2 \sin(A) \cos(A)}{\cos^2(A)} \\ &= \underline{2 \sin(A) \cos(A)} \end{aligned}$$

$$11. \cot x = \frac{\sin(2x)}{1 - \cos(2x)}$$

$$\begin{aligned} \frac{\cos(x)}{\sin(x)} &= \frac{2 \sin(x) \cos(x)}{1 - [1 - 2 \sin^2(x)]} \\ &= \frac{2 \sin(x) \cos(x)}{2 \sin^2(x)} \\ &= \frac{\cos(x)}{\sin(x)} \end{aligned}$$

$$10. \sin(2x) = 2 \cot x \sin^2 x$$

$$\begin{aligned} \frac{2 \sin(x) \cos(x)}{\sin(x)} &= \frac{2 \cos(x)}{\sin(x)} \cdot \sin^2 x \\ &= \underline{2 \cos(x) \sin(x)} \end{aligned}$$

$$12. \sin(2x)(\cot x + \tan x) = 2$$

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

$$2 \sin(x) \cos(x) \left(\frac{\cos^2 x + \sin^2 x}{\sin(x) \cos(x)} \right)$$

$$2 \sin(x) \cos(x) \left(\frac{1}{\sin(x) \cos(x)} \right) = \underline{2}$$

$$13. \csc x \sec x = 2 \csc(2x)$$

$$\begin{aligned} \frac{1}{\sin x} \cdot \frac{1}{\cos x} &= \frac{2}{\sin(2x)} \\ &= \frac{2}{2 \sin x \cos x} \\ &= 1 \cdot \frac{1}{\sin x} \cdot \frac{1}{\cos x} \\ &= \underline{\csc x \sec x} \end{aligned}$$