

1. Find the value of the following.

a) $\sin 105^\circ$

$$\frac{\sqrt{6} + \sqrt{2}}{4}$$

b) $\cos \frac{\pi}{12}$

$$\frac{\sqrt{6} + \sqrt{2}}{4}$$

c) $\tan \frac{11\pi}{12}$

$$-2 + \sqrt{3} - \frac{(\sqrt{6} - \sqrt{2})^2}{4}$$

2. Given that $\sin \alpha = \frac{5}{13}$ ($\frac{\pi}{2} < \alpha < \pi$) and $\cos \beta = -\frac{4}{5}$ ($\pi < \beta < \frac{3\pi}{2}$). Find the following.

a) $\sin(\alpha - \beta)$

$$-\frac{56}{65}$$

b) $\sec(\alpha - \beta)$

$$\frac{65}{33}$$

3. Write the trig expression as an algebraic expression. $\cos(\arctan 2x - \arcsin x)$

$$\frac{\sqrt{1-x^2} + 2x^2}{\sqrt{1+4x^2}}$$

4. Find the exact values of $\sin 2u$, $\cos 2u$, and $\tan 2u$. Given the following.

a) $\tan u = -\frac{5}{3}$, ($\frac{\pi}{2} < u < \pi$)

$$\sin 2u = \frac{-15}{17}$$

$$\cos 2u = \frac{-5}{17}$$

$$\tan 2u = \frac{15}{8}$$

b) $\sec u = -4$, ($\pi < u < \frac{3\pi}{2}$)

$$\sin 2u = \frac{\sqrt{15}}{8}$$

$$\cos 2u = \frac{-2}{8}$$

$$\tan 2u = \frac{-\sqrt{15}}{7}$$

5. Write $\sin^4 x$ in terms of the first power of cosine.

$$\frac{1}{8} (3 - 4\cos 2x + \cos 4x)$$

6. Find the exact values of $\sin \frac{u}{2}$, $\cos \frac{u}{2}$, and $\tan \frac{u}{2}$. Given the following.

a) $\sin u = -\frac{3}{5}, \left(\pi < u < \frac{3\pi}{2}\right)$

$$\sin\left(\frac{u}{2}\right) = \frac{3\sqrt{10}}{10}$$

$$\cos\left(\frac{u}{2}\right) = -\frac{\sqrt{10}}{10}$$

$$\tan\left(\frac{u}{2}\right) = -3$$

b) $\cot u = -3, \left(\frac{3\pi}{2} < u < 2\pi\right)$

$$\sin\left(\frac{u}{2}\right) = \sqrt{\frac{10-3\sqrt{10}}{20}} \text{ or } \frac{\sqrt{50-15\sqrt{10}}}{10}$$

$$\cos\left(\frac{u}{2}\right) = -\sqrt{\frac{10+3\sqrt{10}}{20}} \text{ or } \frac{\sqrt{50+15\sqrt{10}}}{10}$$

$$\tan\left(\frac{u}{2}\right) = \frac{-10+3\sqrt{10}}{\sqrt{10}} \text{ or } -\sqrt{10} + 3$$

7. Write the following sums as products and write the products as sums.

a) $8\cos 2x \sin 7x$

$$4[\sin 9x + \sin 5x]$$

b) $\sin 3x - \sin 9x$

$$-2\cos(6x)\sin(3x)$$

c) $\sin(x+y)\cos(x-y)$

$$\frac{1}{2}[\sin 2x + \sin 2y]$$

d) $\sin(x+\pi) + \sin(x-\pi)$

$$2\sin x \cos \pi$$

8. Solve the following in the interval $[0, 2\pi)$.

a) $\sin 2x = \cos x$

$$x = \frac{\pi}{2}, \frac{3\pi}{2}, \frac{\pi}{6}, \frac{5\pi}{6}$$

c) $4\cos^2 x = 1$

$$x = \frac{\pi}{3}, \frac{2\pi}{3}, \frac{4\pi}{3}, \frac{5\pi}{3}$$

d) $\sin\left(x + \frac{\pi}{4}\right) + \sin\left(x - \frac{\pi}{4}\right) = -1$

$$x = \frac{5\pi}{4}, \frac{7\pi}{4}$$

b) $\tan^2 3x = 3$

$$x = \frac{\pi}{9}, \frac{2\pi}{9}, \frac{4\pi}{9}, \frac{5\pi}{9}, \frac{7\pi}{9}, \frac{8\pi}{9}, \frac{10\pi}{9}, \frac{11\pi}{9}, \frac{13\pi}{9}, \frac{14\pi}{9}, \frac{16\pi}{9}, \frac{17\pi}{9}$$

e) $\tan^2 x - 6\tan x + 4 = 0$

$$x = 1.3821, 4.5237, .6524, 3.794$$

e) $\sin \frac{x}{2} + \cos x - 1 = 0$

$$x = 0, \frac{\pi}{3}, \frac{5\pi}{3}$$