

**Problem 1.** Use sum, difference or half angle formula to determine the following values.

a.  $\sin\left(\frac{-7\pi}{12}\right)$

b.  $\sin\left(\frac{-\pi}{12}\right)$

c.  $\tan\left(\frac{13\pi}{12}\right)$

d.  $\cot\left(\frac{11\pi}{8}\right)$

**Problem 2.** Use half angle formula to fill in the blanks.

$$[\sin(7x)]^4 = [\ ] - \frac{1}{2} \cos([\ ]x) + \frac{1}{8} \cos([\ ]x)$$

**Problem 3.** Use sum or difference formula to determine  $A$  and  $B$ .

a.  $\sin\left(\frac{19\pi}{12}\right) = -\frac{\sqrt{A}(\sqrt{B}+1)}{4}$

b.  $\cos\left(\frac{-\pi}{12}\right) = \frac{\sqrt{A}(\sqrt{B}+1)}{4}$

**Problem 4.** Solve the following equations in the interval  $[0, 2\pi]$ .

a.  $\sin^2(t) = \frac{1}{2}$

b.  $|\tan(t)| = \sqrt{3}$

c.  $2\cos^2(t) - \cos(t) - 1 = 0$

d.  $\sin^2(t) = \frac{1}{16}$

**Problem 5.** Find all solutions of the following equations as  $A + Bk\pi$  and  $C + Dk\pi$  where  $k$  is an integer.

a.  $2\sin(x) + \sqrt{3} = 0$

b.  $\cos(x)\sin(x) - 2\cos(x) = 0$

**Problem 6.** Evaluate the following expression. Your answer must be an angle in  $[-\frac{\pi}{2}, \pi]$ .

a.  $\sin^{-1}\left(\sin\left(-\frac{\pi}{3}\right)\right)$

b.  $\sin^{-1}\left(\sin\left(\frac{2\pi}{3}\right)\right)$

c.  $\cos^{-1}\left(\cos\left(\frac{\pi}{6}\right)\right)$

d.  $\cos^{-1}\left(\cos\left(\frac{7\pi}{6}\right)\right)$

**Problem 7.** Evaluate the following expression. Your answer must be an angle in  $[-\frac{\pi}{2}, \frac{\pi}{2}]$ .

a.  $\tan^{-1}\left(\tan\left(-\frac{7\pi}{6}\right)\right)$

b.  $\tan^{-1}\left(\tan\left(\frac{\pi}{6}\right)\right)$

c.  $\tan^{-1}\left(\tan\left(-\frac{5\pi}{6}\right)\right)$

**Problem 8.** Find the exact value of each expression.

a.  $\sin\left(\cos^{-1}\left(\frac{3}{5}\right)\right)$

b.  $\sin\left(\tan^{-1}\left(\frac{12}{5}\right)\right)$

c.  $\tan\left(\cos^{-1}\left(\frac{5}{13}\right)\right)$

d.  $\sin\left(\tan^{-1}\left(\frac{x}{5}\right)\right)$

e.  $\tan\left(\sin^{-1}\left(\frac{x}{5}\right)\right)$

f.  $\frac{1}{2} \sin\left(2\sin^{-1}\left(\frac{x}{5}\right)\right)$

**Problem 9.** The number of bacteria in a culture is given by the function

$$n(t) = 940e^{0.45t}$$

where  $t$  is measured in hours.

- What is the relative rate of growth of this bacterium population? (percent)
- What is the initial population of the culture (at  $t=0$ )?
- How many bacteria will the culture contain at time  $t=5$ ?

**Problem 10.** Use the Laws of logarithms to find  $A$ ,  $B$ , and  $C$ .

$$\ln \left( x^{13} \sqrt{\frac{y^2}{z^{10}}} \right) = A \ln(x) + B \ln(y) + C \ln(z)$$