

April 26

Exact Values of ^{sec}Secant and ^{csc}Cosecant

Using Unit Circle:

Flip it! \rightarrow reciprocal of cosine = secant value
 \rightarrow reciprocal of sine = cosecant value

$$\text{Ex1) } \sec 240^\circ = -\frac{2}{1} = \boxed{-2}$$

$$\cos 240^\circ = -\frac{1}{2} \curvearrowright$$

$$\text{Ex2) } \sec 390^\circ = \boxed{\frac{2}{\sqrt{3}}}$$

$$390 - 360 = 30^\circ$$

$$\cos 30^\circ = \frac{\sqrt{3}}{2} \curvearrowright$$

$$\text{Ex3) } \csc \frac{7\pi}{4} = \boxed{-\frac{2}{\sqrt{2}}}$$

$$\sin \frac{7\pi}{4} = -\frac{\sqrt{2}}{2} \curvearrowright$$

$$\text{Ex4) } \csc -270^\circ = \frac{1}{1} = \boxed{1}$$

$$-270 + 360 = 90^\circ$$

$$\sin 90^\circ = \frac{1}{1} \curvearrowright$$

$$\text{Ex5) } \sec \frac{3\pi}{2} = \frac{1}{0} = \boxed{\text{undefined}}$$

$$\cos \frac{3\pi}{2} = \frac{0}{1} \curvearrowright$$

Exact Values of ^{tan}Tangent and ^{cot}Cotangent

Using Unit Circle:

sine \div cosine = tangent value

cosine \div sine = cotangent value

$$\begin{aligned} \text{Ex 6) } \tan 210^\circ &= -\frac{1}{2} \div -\frac{\sqrt{3}}{2} \quad \begin{array}{l} \text{Keep} \\ \text{Change} \\ \text{Flip} \end{array} \\ &= \cancel{-\frac{1}{2}} \cdot \cancel{-\frac{2}{\sqrt{3}}} \\ &= \boxed{\frac{1}{\sqrt{3}}} \end{aligned}$$

$$\sin 210^\circ = -\frac{1}{2}$$

$$\cos 210^\circ = -\frac{\sqrt{3}}{2}$$

$$\begin{aligned} \text{Ex 7) } \tan -\frac{10\pi}{3} &= \frac{\sqrt{3}}{2} \div -\frac{1}{2} \\ &= \frac{\sqrt{3}}{\cancel{2}} \cdot -\frac{\cancel{2}}{1} \\ &= -\frac{\sqrt{3}}{1} = \boxed{-\sqrt{3}} \end{aligned}$$

$$-\frac{10\pi}{3} + 2\pi = -\frac{4\pi}{3} + 2\pi = \frac{2\pi}{3}$$

$$\sin \frac{2\pi}{3} = \frac{\sqrt{3}}{2}$$

$$\cos \frac{2\pi}{3} = -\frac{1}{2}$$

$$\begin{aligned} \text{Ex 8) } \cot \frac{\pi}{4} &= \frac{\sqrt{2}}{2} \div \frac{\sqrt{2}}{2} \\ &= \frac{\cancel{\sqrt{2}}}{\cancel{2}} \cdot \frac{\cancel{2}}{\cancel{\sqrt{2}}} \\ &= \boxed{1} \end{aligned}$$

$$\cos \frac{\pi}{4} = \frac{\sqrt{2}}{2}$$

$$\sin \frac{\pi}{4} = \frac{\sqrt{2}}{2}$$

$$\begin{aligned} \text{Ex 9) } \cot 810^\circ &= 0 \div 1 \\ &= \boxed{0} \end{aligned}$$

$$810 - 360 = 450 - 360 = 90^\circ$$

$$\cos 90^\circ = 0$$

$$\sin 90^\circ = 1$$