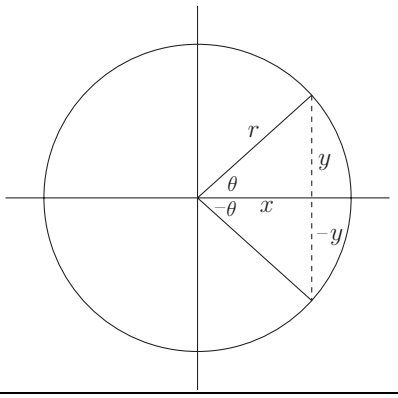
Identity Proofs Name:_____

**Definitions:**

$$\sin\theta = \frac{y}{r} \qquad \cos\theta = \frac{x}{r} \qquad \tan\theta = \frac{y}{x}$$

$$\csc\theta = \frac{r}{y} \qquad \sec\theta = \frac{r}{x} \qquad \cot\theta = \frac{x}{y}$$




**Reciprocal Identities:**

$$\csc\theta = \frac{1}{\sin\theta} \qquad \sec\theta = \frac{1}{\cos\theta} \qquad \cot\theta = \frac{1}{\tan\theta}$$

**Odd/Even Identities:**

$$\sin(-\theta) = -\sin\theta \qquad \cos(-\theta) = \cos\theta \qquad \tan(-\theta) = -\tan\theta$$

**Fundamental Identities:**

1. $\tan\theta = \dfrac{\sin\theta}{\cos\theta} \quad \longrightarrow \quad \cot\theta = \dfrac{\cos\theta}{\sin\theta}$

2. $\sin^2\theta + \cos^2\theta = 1 \quad \longrightarrow \quad \tan^2\theta + 1 = \sec^2\theta, \quad 1 + \cot^2\theta = \csc^2\theta$

**Sum and Difference Identities:**

1. $\cos(\theta - \phi) = \cos\theta\cos\phi + \sin\theta\sin\phi$
2. $\cos(\theta + \phi) = \cos\theta\cos\phi - \sin\theta\sin\phi$
3. $\sin(\theta - \phi) = \sin\theta\cos\phi - \sin\phi\cos\theta$
4. $\sin(\theta + \phi) = \sin\theta\cos\phi + \sin\phi\cos\theta$
5. $\tan(\theta + \phi) = \dfrac{\tan\theta + \tan\phi}{1 - \tan\theta\tan\phi}$
6. $\tan(\theta - \phi) = \dfrac{\tan\theta - \tan\phi}{1 + \tan\theta\tan\phi}$

**Double Angle Identities:**

1. $\sin(2\theta) = 2\sin\theta\cos\theta$
2. $\cos(2\theta) = \cos^2\theta - \sin^2\theta$
3. $\cos(2\theta) = 1 - 2\sin^2\theta$
4. $\cos(2\theta) = 2\cos^2\theta - 1$

**Half Angle Identities:**

1. $\sin\left(\dfrac{\alpha}{2}\right) = \pm\sqrt{\dfrac{1-\cos\alpha}{2}}$
2. $\cos\left(\dfrac{\alpha}{2}\right) = \pm\sqrt{\dfrac{1+\cos\alpha}{2}}$
3. $\tan\left(\dfrac{\alpha}{2}\right) = \pm\sqrt{\dfrac{1-\cos\alpha}{1+\cos\alpha}}$