

1. (5pts) Find exact values of the following expressions. A picture may help you.

$$\arcsin \frac{1}{2}$$

$$\arctan 1$$

$$\arccos \left( -\frac{\sqrt{3}}{2} \right)$$

2. (8pts) Find the exact values of the following expressions. A picture will be helpful for some of them.

$$\sin \left[ \arcsin \left( \frac{1}{7} \right) \right]$$

$$\arccos \left[ \cos \left( -\frac{\pi}{3} \right) \right]$$

$$\arcsin \left[ \sin \left( \frac{5\pi}{8} \right) \right]$$

3. (4pts) Compute the exact value of  $\sin(\arctan 6)$ . Use a picture.

Use basic trigonometric identities to establish the following identities:

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

5. (4pts)  $\tan \theta(\sec \theta + \tan \theta) = \sec \theta(\sec \theta + \tan \theta) - 1$

6. (7pts)  $\frac{\cos \theta}{1 + \sin \theta} + \frac{1 + \sin \theta}{\cos \theta} = 2 \sec \theta$

7. (6pts) Use addition formulas to find the exact values.

a)  $\sin 75^\circ =$

b)  $\cos \frac{5\pi}{12} \cos \frac{7\pi}{12} - \sin \frac{5\pi}{12} \sin \frac{7\pi}{12} =$

Use addition formulas to establish the following identities:

8. (3pts)  $\tan(\theta + \pi) = \tan \theta$

9. (4pts)  $\frac{\cos(\alpha + \beta)}{\cos \alpha \cos \beta} = 1 - \tan \alpha \tan \beta$

**10.** (6pts) Suppose that  $\frac{\pi}{2} < \alpha < \pi$  and  $-\frac{\pi}{2} < \beta < 0$  are angles so that  $\sin \alpha = \frac{1}{4}$  and  $\sin \beta = -\frac{2}{5}$ . Find the exact value of  $\sin(\alpha - \beta)$ .

**Bonus** (5pts)

- a) Try to use the addition formula for tangent in order to establish the identity  $\tan\left(\frac{\pi}{2} + \theta\right) = -\frac{1}{\tan \theta}$ .  
What goes wrong?
- b) Find another way to establish this identity.