

**Purpose:** In this problem set, we will solve trigonometric equations using the pythagorean identities, the negative angle identities, and the reciprocal identities.

1. Before we get started, we need to gather all of our trigonometric identities. **This should take no more than 4 minutes.** I would suggest splitting the work among your group-mates.

(a) There are *three* pythagorean identities. List them below.

(b) There are *six* negative angle identities. List them below.

(c) There are *four* reciprocal identities (i.e., the other trig functions expressed in sines and cosines). List them below.

2. There are *four* sum and difference identities. We'll add them to the space below together as class progresses. You should have one before you move to the next page.

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3. Using the sum and difference identities, simplify the following expressions.

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

(b)  $\cos\left(\frac{\pi}{2} - \theta\right)$

(c)  $\sin\left(\frac{\pi}{2} - \theta\right)$

(d)  $\sin(\alpha + \beta)$

(e)  $\tan(\alpha + \beta)$

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4. Compute  $\sin\left(\frac{\pi}{12}\right)$ . *Hint:*  $\frac{\pi}{12} = \frac{4\pi}{12} - \frac{3\pi}{12}$ .

5. Compute  $\sin\left(\frac{\pi}{18}\right)\sin\left(\frac{7\pi}{18}\right) + \sin\left(\frac{4\pi}{9}\right)\sin\left(\frac{\pi}{9}\right)$ .

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6. We can use these identities to build new formulas! We will do one together but you will need to know all *four* given in the text (Section 7.2).

(a) Our goal is to find a formula for  $\sin(\alpha) \sin(\beta)$ . Write down the two identities from today that involve this term.

(b) Subtract one equation from the other.

(c) Solve for  $\sin(\alpha) \sin(\beta)$ .

7. We will list all three of the Product-to-Sum Identities, including the one you just found, here.

8. There are also *four* Sum-to-Product identities. We will list them below together.