

Purpose: In this problem set, we will build the final few trigonometric identities we need to solve problems.

1. Before we get started, we need to gather all of our trigonometric identities. **This should take no more than 6 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.

(d) There are *four* sum and difference identities. List them below.

(e) There are *three* product-to-sum identities. List them below.

(f) There are *four* sum-to-product identities. List them below.

2. Now, we will find the *double angle identities*.

(a) Find a formula for $\sin(2\alpha)$ using some of the identities on the previous page. List them as you use them.

(b) Find a formula for $\cos(2\alpha)$ using some of the identities on the previous page. List them as you use them.

3. Moving along, let's find the *power reduction identities*. By *power reduction*, we want a way to take a power of a trig function and write it in terms of smaller powers of trig functions.

(a) Let's start with cosine. Write the version of the double angle identity for cosine involving only cosines below.

(b) Isolate the cosine squared term. (This will be the high power that we want to reduce.)

(c) Ta-Da! Write your newfound identity below.

(a) Let's move to sine. Write the version of the double angle identity for cosine involving only sine squared and cosine (not squared) below.

(b) Isolate the sine squared term. (This will be the high power that we want to reduce.)

(c) Voila! Write your newfound identity below.

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4. Finally, we want the *half-angle identities*. That is, we want formulas that involve the original angle to find the trig function values of half of that angle. Use your tools that we've added to our tool box in the last few pages to find nice formulas (without fractional angles) for the following trig functions.

A word of caution: Don't try to set something equal to these expressions immediately. Start from an identity we have and find these expressions living inside.

(a) $\cos\left(\frac{\theta}{2}\right)$

(b) $\sin\left(\frac{\theta}{2}\right)$

5. Now that you have all of the trig identities at your disposal, your next task is to memorize all of them and learn how to use them. Describe your plan of attack below.