

**Chapter 5, Section 1:** (Main idea: Algebra and Trig)

Problems 21-28 are just like problems you learned to work in 1.4 and you'll need these ideas more in Chapter 6.

The negative-angle identities are new here. Look at your six basic trig graphs and notice that those graphs make it very easy to remember these negative-angle identities. If you don't understand that, please ask.

If you followed instructions for the supplement in Chapter 3, you should have already practiced the algebra needed for this section quite a lot. If you did not work on that supplement enough to become very comfortable with the algebra, then you must get additional help immediately. This is very important material!

5.1: # 1, 2, 4, 5, 9, 11, 18, 21, 23, 25, 29-33, 41, 49, 53, 57, 61, 65, 67

**Chapter 5, Section 2:** (Main idea: Verifying Identities)

Problems 33-68 are some of the most important types of problems in this course. The practice that they provide in dealing with trigonometric expressions is crucial for success in later courses that use trigonometry. Many students find this material difficult. Here are some suggestions/requirements.

1. (REQUIRED) Verifying identities is NOT the same as solving equations. You can't "do the same thing to both sides." All you can do is change the form of one side at a time by using various algebraic methods.
2. (SUGGESTED) Usually we start with the more complex-looking side of the identity and try to rewrite it, using correct algebra, until we get something that we can simplify to look like the other side.
3. (SUGGESTED) In about 80% of the problems, it is easiest to rewrite the various functions in terms of sine and cosine so that there are fewer functions to deal with.
4. (SUGGESTED) Sometimes is a simple algebraic simplification that can be done first, such as factoring and reducing. Look at problem 61, for example.

Most mistakes students make on these problems are involve using an algebraic simplification that is

simply not correct, such as  $\frac{x}{x+y} = \frac{1}{1+y}$  (WRONG!) When you are working on these problems, think

very carefully about each step. If you make an incorrect algebraic simplification, you will miss the entire problem.

The material in this section will be an important part of Test 3 and also an important part of the make-up test.

5.2: # 1,3,5,13,15,17,19,21,33,35,39,41,43,45,49,53,55, 61

Do these a week or so later, for review: 5.2: # 57, 59, 63, 65, 67, 68

**Review for Make-Up Test:**

After Test 2 is completed, instructions for the Make-Up Test will be provided on the course website. That test will be in the Testing Center and will have two parts, one for which you may use a calculator and one for which you MAY NOT use a calculator. You will take them as two separate tests because of the calculator issue, but together they have 100 points on them and count as one test grade. They are labeled Test 1 and Test 2 makeup test, but both cover all the material. (Test 1 makeup allows calculator.) You will have the appropriate formula sheet, with blanks for the formulas you must memorize.

Please review

- Every problem on Tests 1 and 2

- Every problem on each Chapter Test for Chapters 1-4
- Every problem on the homework for Chapter 5, sections 1 and 2.

**Chapter 5, Section 3:** (Main idea: Sum and Difference Identities for Cosine)

Memorize both of these identities.

The most important insight you must obtain in this section is

$$\cos(A - B) \neq \cos A - \cos B$$

At this point in their studies, students are frequently thinking of the symbol  $\cos$  just as a number rather than a function, and so they try to use the distributive property when they see parentheses. That is incorrect. Careful attention to the formulas and examples will help you develop skill in dealing with trig functions.

The derivation of the formula for  $\cos(A - B)$  is one of the more complex proofs we'll see in the course, but it is worthwhile for you to understand the overview, at least. You will not be required to reproduce it. Look carefully at p. 197, Figure 4, and see if you agree with all the labels. By using these points and the formula for the distance between two points, you can derive this formula.

It is absolutely crucial that you be able to start with the formula for  $\cos(A - B)$  and derive the formula for  $\cos(A + B)$ . See that on p. 198.

We'll also use the cofunction identities here. Remember that the cofunction identities were justified by right triangles, but are actually true for all angles.

You can use these formulas to find exact values for the cosine of many new angles (such as  $15^\circ$ ), to simplify various expressions, and to prove more trigonometric identities.

5.3: # 5,9,11,13,27,29,33,35,37,39,47,49,52,53,55,63,65,67

**Chapter 5, Section 4:** (Main idea: Sum and Difference Identities for Sine and Tangent)

There are four new identities in this section. You only need to memorize those for the sine function. However, you should be able to derive all four of them from the identities in the previous section. Now is a good time to download the entire formula sheet that you will be able to use on Test 3 so that you can be sure to memorize all the necessary formulas.

You can use these formulas to find exact values for the sine or tangent of many new angles (such as  $15^\circ$ ), to simplify various expressions, and to prove more trigonometric identities. The problems involving trig identities are particularly important in this section.

Using these formulas to find exact values for the sine or tangent of new angles is fairly straightforward. However, when you are using the tangent formulas, rationalizing the denominator is harder than in the earlier chapters because the denominator has two terms. Pay careful attention to Example 1, where rationalizing a two-term denominator is illustrated.

Notice that there are sometimes difficulties in determining how to use the formula for the tangent of a sum. For instance,

$$\tan(60^\circ) \neq \tan(90^\circ - 30^\circ)$$

because

$$\begin{aligned} &= \frac{\tan 90^\circ - \tan 30^\circ}{1 + \tan 90^\circ \cdot \tan 30^\circ} \\ &= \frac{\text{not defined} - 1}{1 + 5 \cdot (\text{not defined}) \cdot 1} \end{aligned}$$

But this is not a correct use of the relationship, since the tangent function is not defined at  $90^\circ$ , so this formula cannot be evaluated. Sometimes it requires some ingenuity to find a way to express the angle in the tangent function so that we avoid using angles for which some functions are undefined.

5.4: # 1, 3, 5, 7, 11, 15, 17, 23, 27, 31, 38, 41, 43, 47, 50, 52, 53, 55, 57, 61

**Chapter 5, Section 5:** (Main idea: Double-Angle Identities)

Notice that the double angle identities are very easy to prove if you begin from the sum formulas.

The double-angle identities are very important. Be sure to memorize/understand them.

It is also very important to notice that

$$\cos(2A) = \cos(A + A)$$

$$\neq 2\cos(A)$$

In addition to learning these identities, it is crucial that you learn to use algebra correctly on every problem.

The Product-to-Sum and Sum-to-Product identities are not as important as the double-angle identities. Be able to use them on straight-forward problems, such as number 57 on the homework. You will not be expected to use these in verifying identities or in solving complex problems. These identities look long and complicated to most students. If they seem intimidating to you, please skip this and concentrate on the other problems in this section.

5.5: # 1, 5, 9, 13, 15, 17, 19, 21, 25, 30, 37, 41, 45, 49, 53, 57

**Chapter 5, Section 6:** (Main idea: Half-Angle Identities)

It is not crucial that you memorize the half-angle identities, but it is important that you be able to derive them.

The half-angle formulas for sine and cosine do not specify whether the result is positive or negative, so you must use other information in the problem to determine the sign of the result.

Rationalizing denominators when the formula itself has a square root in it can be complicated. See Example 1.

5.6: # 3, 9, 11, 15, 19, 21, 23, 27, 29, 33, 35, 39, 49, 51, 55, 57, 59, 62

**Summary Exercises on Verifying Trig Identities:** (More practice)

You are not required to do these for the homework, but use them if you need more practice. Remember to be very careful about the algebra.

**Chapter 5 Test:**

Remember that no calculator will be allowed on Test 3. The formula sheet, with blanks as indicated, will be provided. Follow the same instructions as for the other sample tests.

Chapter 5 Test: Do all problems. On problems 5 & 6, since you don't have graphing technology to use on the test, write the expression in terms of sine and cosine and simplify.

Extra work: As needed. You are not required to submit any extra work.