# Using Double-Angle Formulas to Find Exact Values

The double-angle formulas are a special case of the sum formulas, where .

The **double-angle formulas** are

Given the tangent of an angle and the quadrant in which is located, use the double-angle formulas to find the exact value.

1) Draw a triangle to reflect the given information.

2) Determine the correct double-angle formula.

3) Substitute values into the formula based on the triangle.

4) Simplify.

Examples

1. Given that and is in quadrant II, find the following:
2. Given , with in quadrant I, find .
3. Simplify the expression

# Use Reduction Formulas to Simplify an Expression

The double-angle formulas can be used to derive the reduction formulas, which are formulas we can use to reduce the power of a given expression involving even powers of sine and cosine.

The **reduction (power-reducing) formulas** are

Examples

1. Rewrite so that it does not involve any power of sine or cosine greater than 1.
2. Use the power-reducing formulas to show .

# Using Half-Angle Formulas to Find Exact Values

These formulas, derived from the reduction formulas, are used when we have an angle that is half the size of a special angle.

The **half-angle formulas** are:

Examples

1. Find using a half-angle formula.
2. Find using a half-angle formula.
3. Given that and lies in quadrant IV, find the exact value of .
4. Given that and lies in quadrant III, find the exact value of the following: