**Sum and Difference Identities**

Finding the exact value of the sine, cosine, or tangent of an angle is often easier if we can rewrite the given angle in terms of two angles that have known trigonometric values, such as those found on the unit circle.

For example: OR

To evaluate the cosine of the angle , we can utilize the sum and difference identities:

Example 1: Evaluate using the sum identity.

Evaluate using the difference identity.

The sine and tangent functions also have sum and difference identities, which are summarized below.

Example 2: Use the sum and difference identities to evaluate the following expressions.

Example 3: Given ; and

Determine the exact value of

Example 4: Determine the exact value of the following expression.

**Double and Half Angle Identities**

In other situations, it is easier to evaluate the sine, cosine, and tangent functions of an angle if it can be expressed as exactly double or half of an angle with a known trigonometric value.

For example: OR

Example 5: Use the Sum Identities to derive the Double Angle Identities for the sine, cosine and tangent functions. Hint:

Double Angle Identities

Example 6: Verify

Half Angle Identities

Example 7: Given and is in Quadrant III, determine the exact values of the following.