Math 4 Honors Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Lesson 4-5: *Double Angle Formulas* Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Learning Goal:

* *I can, without a calculator, use trigonometric identities such as angle addition/subtraction and double angle formulas, to express values of trigonometric functions in terms of rational numbers and radicals.*

***The Grand Finale . . .***

The sum & difference formulas that we used in the previous investigations can be used to derive double angle formulas. In this investigation we will derive a total of six double angle formulas for sine, cosine & tangent.

A. There is one formula for **sin (2*x*).**

To derive a formula for sin (2*x*), think of sin (2*x*) as **sin (*x* + *x*)**. Then use the sin (α + β) formula.

**sin (2*x*) = sin (*x* + *x*) =**

B. There are 3 formulas for **cos (2*x*)**.

To derive a formula for cos (2*x*), use the same process you did in part A.

**cos (2*x*)** = **cos (*x* + *x*) =**

Now use your result from above to write 2 more formulas for **cos (2*x*)** – one in terms of just sine & one in terms of just cosine.

**cos (2*x*)** = **cos (2*x*) =**

C. There are 2 formulas for **tan (2*x*)**.

To get the first one, “stack up” sin (2*x*) & cos (2*x*). **tan (2*x*) =**

To derive the second one for tan (2*x*), use the same process you did in part A.

**tan (2*x*) = tan (*x + x*) =**

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Transfer all six formulas you derived on the front of this page, below.

*Call the Heinl over to your group for verification of your formulas.*



**Once you have Heinl approval, try examples 1 - 4. *No calculator!***



1. If find



2. If

In what quadrant does 2*x* lie? How do you know?



3. Solve for primary values: 4. Verify:

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**Class examples**: **Solve for primary values.**

5. 2sin(2*x*) + 1 = 0 6. 

**U4 L1 I5 Homework:**

1.  **Find: sin 2*x,* cos 2*x,* tan 2*x.* In what quadrant does 2*x* lie?**

2.  **Find: sin 2*x,* cos 2*x,* tan 2*x.* In what quadrant does 2*x* lie?**

3. Solve for primary values: 

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4. Solve for primary values: 

5. Solve for primary values: 



6. Solve for primary values:

7. Verify:  8. Verify:



9. Verify:

 *Hints: Work only on the left side & .*