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

**4-8 Double Angle Formulas** Date\_\_\_\_\_

*In this activity, you will be working towards the following learning goals:*

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*) =**

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

*Call me over to your group for verification of your formulas.*



**Check with me to make sure you are correct, then 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 (answer(s) in radians):



4. Verify:



5. Solve for primary values (answer(s) in **degrees**): 2sin(2*x*) + 1 = 0

*Hint: Start by graphing and seeing how many x-intercepts this function has.*

6. Solve for primary values (answer(s) in radians): 