Name: _____ Date: _____

QUADRATIC TRIGONOMETRIC EQUATIONS
ALGEBRA 2 WITH TRIGONOMETRY

Quadratic trigonometric equations are ones that involve products of trigonometric functions. Before we begin our study of these types of equations, it is important to introduce a new, and potentially confusing, convention.

QUADRATIC TRIGONOMETRIC CONVENTION

$$\sin^2 x = (\sin x)^2 \qquad \text{and} \qquad \cos^2 x = (\cos x)^2$$

This convention now allows us to write quadratic trigonometric equations in a more compact way. To solve these equations, we will generally use the Zero Product Law in order to produce two linear equations.

***Exercise* #1:** Consider the trigonometric equation $\sin^2 x - 4\sin x - 5 = 0$ on the interval $0^\circ \le x \le 360^\circ$.

(a) Factor the left-hand side of this equation.

(b) Using the Zero Product Law, write two linear equations whose solution comprises the solution set of the quadratic trigonometric equation.

(c) Solve each equation and state the solution set of the quadratic trigonometric equation.

Solving quadratic trigonometric equations is simply comprised of solving two linear equations. These two linear equations are mostly found through factoring and the Zero Product Law. Keep in mind that the three most common types of factoring – gcf, difference of perfect squares, and trinomial guess-and-check – will be used.

***Exercise* #2:** Solve the equation $2\cos x \sin x - \cos x = 0$ for all values of x on the interval $0^\circ \le x \le 360^\circ$.

***Exercise* #3:** For the interval $0^\circ \le \theta \le 360^\circ$ solve $16\cos^2\theta - 1 = 0$. Round all answers to the nearest *tenth* of a degree.

***Exercise* #4:** Solve the equation $3\sin^2\alpha + 14\sin\alpha + 8 = 0$ for all values on the interval $0^\circ \le \alpha \le 360^\circ$. Round all answers to the nearest *tenth* of a degree.

We can also be expected to solve quadratic trigonometric equations that happen to be **incomplete**.

***Exercise* #5:** For the interval $0^\circ \le \theta \le 360^\circ$ solve $2\sin^2\theta - 1 = 0$.

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QUADRATIC TRIGONOMETRIC EQUATIONS
ALGEBRA 2 WITH TRIGONOMETRY - HOMEWORK

SKILLS

1. Solve each of the following quadratic trigonometric equations for all values of x on the interval $0^\circ \le x \le 360^\circ$. Express any non-integer solutions to the nearest *tenth* of a degree.

(a) $4\sin^2 x - 1 = 0$

(b) $3\cos^2 x + \cos x - 2 = 0$

(c) $5\sin x \cos x + 2\sin x = 0$

(d) $4\cos^2 x - 3 = 0$

(e) $\sin^2 x + 6\sin x + 5 = 0$

(f) $2\cos^2 x + 7\cos x + 3 = 0$

2. Which of the following is not a solution to $\cos^2 x = \frac{1}{4}$?

(1) 60° (3) 150°

(2) 240° (4) 120° _____

4. Which of the following trigonometric equations has no real number solutions?

(1) $\sin^2 x - 4 = 0$ (3) $\sin^2 x + \sin x = 0$

(2) $\sin^2 x - 1 = 0$ (4) $\sin^2 x + 5\sin x = 0$ _____

5. Which of the following represents the largest solution, on the interval $0 \le \alpha \le 360^\circ$, to the equation $2\sin x \cos x + \cos x = 0$?

(1) 180° (3) 270°

(2) 300° (4) 330° _____

6. If the curves $y = \sin^2 x$ and $y = \sin x$ were graphed over the interval $0 \le x \le 360^\circ$, at what coordinate points would they intersect? Algebraically determine your answer.

7. *Algebraically* determine the *x*-intercepts of the function $y = 2\cos^2 x - 1$ on the interval $0 \le x \le 360^\circ$.