Integrated Algebra 2 and Trigonometry

Quarter 1

I: Functions: Composition

I.1 (A.42) Composition of linear functions $f(g(x))$. $f(x) + g(x)$.

I.2 (A.42) Composition of linear and quadratic functions

II: Functions: Quadratic

II.1 Parabola – The graph of a function of degree 2

(A.46; A.70) What are the characteristics of the following functions:

$f(x) = x^2$, $f(x) = -x^2$, $f(x) = 5x^2$, $f(x) = 1/5x^2$.

$f(x) = x^2 + 3$, $f(x) = -x^2 + 3$, $f(x) = 5x^2 + 3$, $f(x) = 1/5x^2 + 3$.

II.2 (A.3) Intersection of parabola and linear equation, $y = f(x)$, $y = 0$, $y = c$ for some constant c.

II.2A Characteristics of a Parabola:

Axis of symmetry (-b/2a)

Finding the Vertex (maximum/minimum)

II.3 (A.20; A.21) Root Theory: x-intercept

Using the graphing calculator and a series of equations, find the

roots/zeroes/solutions of each equation.

II.4 (A.2; A.25) Quadratic Formula; discriminant.

Determine the nature of the roots using discriminant. $B^2 - 4ac$

II.5 Maximize Volume and Area: Various projects

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III: Inverses of Linear and Quadratic Functions

III.1 **(A.43)** Determine if a function is 1 to 1, onto or both

III.2 **(A.44)** Finding the inverse function of f(x)

III.3 Graphing the inverse function of f(x)

III.4 Using lines of symmetry y =x to graph the inverse function of f(x)

IV: Trigonometry: The Sine Function

IV.1 **(A.60; A.62)** Sine as the y-value for unit circle for $0 \leq \theta \leq 90°$

IV.2 **(A.57; A.62)** Sine as the y-value for unit circle for $90 \leq \theta \leq 360°$

IV.3 **(A.57)**   Reference angles

IV.4 **(A.46; A.70)** Graph of the sine function: Amplitude (A sin x + D)

IV.5 **(A.55; A.56)** Sine function for special triangles: 30-60-90; 45-45-90

IV.6 **(A.73)** Use Law of Sines to find unknown sides or angles of triangles

V: Statistics: Mean and Median

V.1 **(N.10)** Understanding the Mean. Sigma ($\sum$) notation

V.2 **(S.5)** Normal Distribution

V.3 **(S.4)** Standard Deviation

V.4 Review of Median and Box/Whisker Plot

V.5 Analysis of Data with Mean and Median:

Mean = Median, Mean > Median, Mean < Median

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Quarter 2

VI: <u>Quadratic Equations</u>

VI.1 **(A.7)** Factoring: Extraction, difference of perfect squares, quadratic trinomials

VI.2 Solving quadratic equations by factoring.

Using a series of trinomial quadratic equations, solve each quadratic by factoring and check solutions by substitution. Use your calculator to verify your answer.

VI.3 **(N.5)** Irrational numbers; Definition of the radical symbol simplifying radical monomials, radical expressions.

VI.4 **(A.13; A.14; 1.15)** Rationalizing denominators, 4 operations

VI.5 **(A.24)** Completing the square

VI.6 **(A.46)** Phase shift for parabola using sine curve as a model

VII: <u>Exponential and Logarithmic Functions</u>

VII.1 **(A.37; A.38)** Relations and functions (defining and comparing/contrasting)

VII.2 **(A.40; A.41** Set notation: Introduction to function symbolism: Domain, range, 1-to-1, image

VII.3 **(A.39)** Finding Domain and Range of a function (ex. $y = -\sqrt{x-3} + 2$

VII.4 **(N.1; A.8; A.9)** Deriving and working with Negative Exponents

VII.5 **(N.1; A.8; A.10; A.11)** Deriving and working with Fractional Exponents

VII.6 **(A.6; A.12; A.53)** Exponential Function (Exponential growth and decay), graph and base e

VII.7 **(A.18; A.19; A.54)** Logarithm Function (common logarithm, natural logarithms); graph

VII.8 **(A.28)** Solving Logarithmic Equations by rewriting as an exponential equation

VII.9 **(A.27)** Solve Exponential Equations with and without common bases

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VIII: The Unit Circle for the Sine Function

VIII.1   **(A.57)**   Coterminal and Reference angles

VIII.2   **(A.60)**   Unit Circle and the Sine Function

VIII.3   Relation of the Unit Circle and the Sine Wave

IX: Regressions AND Sequences/Series

IX.1   **(S.6; S.8)** Linear Regression and the correlation coefficient

IX.2   **(S.6)** Exponential Regression

IX.3   **(S.6)** Quadratic Regression

IX.4   **(S.6)**   Power Regression

IX.5   **(A.29)** Identify an arithmetic or geometric sequence and find the formula for the nth term

IX.6   **(A.30)**   Determine the common difference in an arithmetic sequence

IX.7   **(A.31)**   Determine the common ratio in a geometric sequence

IX.5   **(A.32)** Determine a specified term of an arithmetic or geometric sequence

IX.6   **(A.33)** Specify terms of a sequence, given its recursive definition

IX.7   **(A.35)** Determine the sum of the first *n* terms of an arithmetic/geometric series

X: Cosine Function

X.1   **(A.60; A.62)** Cosine as the x-value for unit circle for $0 \leq \theta \leq 90°$

X.2   **(A.60; A.62)** Cosine as the y-value for unit circle for $90 \leq \theta \leq 360°$

X.3   **(A.57)** Reference angles and coterminal angles

X.4   **(A.46; A-70)** Graph of the Cosine function: Amplitude (A cos x + D)

X.5   **(A.55; A.56)** Cosine function for special triangles: 30-60-90; 45-45-90

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Quarter 3

XI: Solving Other Algebraic and Transcendental Equations

XI.1 **(A.1)** Solve absolute value and inequalities involving linear equations

XI.2 Solving quadratic equations by factoring

XI.3 **(A.25)** Solving quadratic equations using the Quadratic Formula

XI.4 **(A.3)** Solving systems of linear/quadratic equations algebraically; extraneous roots

XI.5 **(A.68)** Solving Trigonometric equations by factoring

XI.6 **(A.68)** Solving Trigonometric equations using the Quadratic Formula

XI.7 **(A.4)** Solving quadratic inequalities

XI.8 **(A.26)** Solve polynomial equations of higher degree that can be solved by factoring and/or the quadratic formula

XII: Radian as an Angle Measure

XII.1 (M.1) Using a radian protractor to find the measure of angles

XII.2 (M.1) Using a radian protractor to find the sum of angles of polygons

XII.3 (M.2) Relation of radian measure and degree measure

XII.4 (M.1) Definition of a radian

XII.5 Using radians in relation to Sine and Cosine Functions

XII.6 Trigonometric Applications including special triangle

XIII: Complex Numbers

XIII.1 (N.6; N.7; N.9) Understanding, operations using complex numbers, powers of i.

XIII.2 Graph of complex numbers

XIII.3 (N.8) Determine the conjugate of a complex number

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XIV: **Permutations**

XIV.1 (S.12) Fundamental Counting Principle

XIV.2 (S.9; S.10; S.12) Calculate the number of possible permutations ($_nP_r$) of n items taken r at a time

XIV.4 (S.12) Use permutations and the Fundamental Counting Principle to determine the number of elements in the sample space and a specific subset (event)

XV: **Tangent Function**

XV.1 Relation of Slope of a line and Tangent

XV.2 (A.60; 62) Tangent as the x-value for unit circle for $0 \leq \theta \leq 90°$

XV.3 Points of discontinuity: Tangent function for multiples of $\pi/_2$ radians

XV.4 (A.60; 62) Tangent as the y-value for unit circle for $90 \leq \theta \leq 360°$

XV.5 (A.57) Reference angles and coterminal angles

XV.6 (A.46; A.70) Graph of the Tangent function: Amplitude (A tan x + D)

XV.7 (A.55; A.56) Tangent function for special triangles: 30-60-90; 45-45-90

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Quarter 4

XVI: **Binomial Probability**

XVI.1 (S.9; S.10; S.12) Calculate the number of possible combinations ($_nC_r$) of n items taken r at a time

XVI.2 (S.13) Calculate theoretical probabilities including geometric applications

XVI.3 S.14) Calculate empirical probabilities

XVI.4 (A.36; S.15) Know and apply the binomial probability formula to events involving the terms *exactly, at least,* and *at most.*

XVI.5 (S.16) Use the normal distribution as an approximation for binomial probabilities.

XVII: **More Trigonometric Functions and Inverse Functions**

XVII.1   (A.58; A.59) Secant, Cosecant and Cotangent Functions as multiplicative inverses

XVII.2   (A.71) Sketch and recognize the graphs of the secant, cosecant and cotangent functions

XVII.3   (A.44) Finding an inverse of algebraic functions

XVII.4   (A.45) Determine the inverse of a function and use composition to justify the result

XVII.4   (A.63; A.64) Inverse of Trigonometric functions, restrictions on domains

XVII.5   (A.65) Sketch the graph of an inverse Trigonometric Function

XVII.6   (A.70; 72) Write the trigonometric function that is represented by a given periodic graph, interpreting amplitude, period, frequency and phase shift.

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XVIII: Circles

XVIII.1   The circle and the Pythagorean Theorem

XVIII.2   **(A.47)**   Determine the center-radius form for the equation of a circle in standard form

XVIII.3   **(A.48)**   Write the equation of a circle, given it center and a point on the circle

XVIII.4   **(A.49)**   Write the equation of a circle from its graph

XIX: Laws of Trigonometric Functions

XIX.1   **(A.73)** Use Law of Cosines to find unknown sides or angles of triangles

XIX.2   **(A.74)** Determine the area of a triangle or parallelogram given the measure of two sides and the included angle.

XIX.3   **(A.75)** Determine the solution(s) from the SSA situation (ambiguous case)

XIX.4   **(A.76)** Apply the angle sum and difference formulas for trigonometric functions

XIX.5   **(A.77)** Apply the double-angle and half-angle formulas for trigonometric functions

XX: Equations with Radicals and Rational Numbers

XX.1   **(A.22)** Solving radical equations

XX.2   **(A.23)** Solving rational equations and inequalities