

**SANTA ROSA CITY SCHOOLS  
CONTENT AND PERFORMANCE STANDARDS  
ADVANCED ALGEBRA**

***Linear, Quadratic, Exponential and Logarithmic Functions:***

<b>Enduring Understanding</b>	<b>ILLUSTRATIONS</b>
<p><b>AdvA1 The student will understand linear, quadratic, exponential and logarithmic functions.</b></p> <p>AdvA1.1 The student will demonstrate meeting the standard in understanding linear, quadratic, exponential and logarithmic functions by representing functions with tables, equations and graphs, and describing connections among these representations.</p>	
<b>Important to Know and Do</b>	
<p>AdvA1.2 The student will demonstrate meeting the standard in understanding linear, quadratic, exponential and logarithmic functions by recognizing properties distinguishing various types of functions (i.e., linear quadratic, exponential, logarithmic) and determining the appropriate type of function to model a given situation.</p> <p>AdvA1.3 The student will demonstrate meeting the standard in understanding linear, quadratic, exponential and logarithmic functions by analyzing data to write equations, draw graphs and make predictions based on linear, quadratic or exponential models.</p> <p>AdvA1.4 The student will demonstrate meeting the standard in understanding linear, quadratic, exponential and logarithmic functions by solving multi-step linear and absolute value equations and inequalities in one unknown and applying these skills to solve practical problems.</p> <p>AdvA1.5 The student will demonstrate meeting the standard in understanding linear, quadratic, exponential and logarithmic functions by determining the intercepts and vertex of quadratic functions using multiple methods (e.g., graphing, factoring, and quadratic formula) and interpreting these results in a given context.</p> <p>AdvA1.6 The student will demonstrate meeting the standard in understanding linear, quadratic, exponential and logarithmic functions by solving quadratic equations (including factoring, and quadratic formula) and interpreting these results in a given context.</p> <p>AdvA1.7 The student will demonstrate meeting the standard in understanding linear, quadratic, exponential and logarithmic functions by simplifying and/or solving exponential and logarithmic equations (using the laws of exponents and logarithms—including the change of base formula).</p>	<p>1.1 a) Graph the functions <math>3x - 4y - 12 = 0</math>, <math>y = -\frac{2}{3}x + 1</math>, and <math>y = 2</math>.</p> <p>1.2 a) How many real solutions must exist for <math>f(x) = \log_3 x</math>?</p> <p>1.4 a) Solve: <math>\frac{2(3x+4)}{3} + \frac{5}{2} \leq 6 + \frac{7(8x+9)}{6}</math></p> <p>1.4 b) Solve: <math>2 3x+4  + 5 = 9</math></p> <p>1.5 a) Find, algebraically and graphically, all the intercepts and the vertex for each function: <math>y = x^2 - 6x + 8</math> and <math>y = x^2 - 8x + 10</math>.</p> <p>1.6 a) How many real roots exist for <math>x^2 + 4x + 4 = 0</math>?</p> <p>1.6 b) Find all imaginary roots (if any) for <math>x^2 + 4x + 5 = 0</math>.</p> <p>1.7 a) Simplify: <math>2\log 3 + 3\log 2</math> and <math>\frac{(2x^2)^3 y^{-4}}{x^3 y^3}</math></p> <p>1.7 b) Solve: <math>2\log 3 = 4</math>, <math>2^x = 3</math>, and <math>\log(3x - 2) = 2\log x</math></p>
<b>Worth Being Familiar With</b>	

***Systems of Equations and Inequalities:***

<b>Enduring Understanding</b>	<b>ILLUSTRATIONS</b>
<b>AdvA2 The student will apply and solve systems of equations and inequalities.</b>	2.1 a) Solve this system by substitution: $3x + 4y = 5$ $x - 6y = 7$
<b>Important to Know and Do</b>	2.1 b) <i>See Application Pages</i>
AdvA2.1 The student will demonstrate meeting the standard of applying and solving systems of equations and inequalities by finding the solution to a system of linear equations by substitution, elimination and graphing.	2.2 Graph each system and label the vertices:
AdvA2.2 The student will demonstrate meeting the standard of applying and solving systems of equations and inequalities by solving systems of linear inequalities through graphing.	$x \leq 3$ a) $y \leq 1$ $y \geq -x + 1$
AdvA2.3 The student will demonstrate meeting the standard of applying and solving systems of equations and inequalities by using systems of functions (with two or three unknowns) to model real situations with equations, inequalities, graphs, and/or tables, and interpret properties of the system, such as the intersection(s), within context.	2.3 <i>See Application Pages</i>
<b>Worth Being Familiar With</b>	2.4 Solve by elimination: $3x + 2y + 4z = 11$ $2x - y + 3z = 4$ $5x - 3y + 5z = -1$
AdvA2.4 The student will demonstrate meeting the standard of applying and solving systems of equations and inequalities by solving systems with three unknowns by elimination, matrices, Cramer's rule, or by using a calculator utility.	

***Conic Sections:***

<b>Enduring Understanding</b>	<b>ILLUSTRATIONS</b>
<b>AdvA3 The student will understand conic sections.</b>	3.1 a) The point (2,5) is on a circle with center at the origin. Write the equation of the circle in standard form.
	3.1 b) Find the points of intersection:

Important to Know and Do	
<p>AdvA3.1 The student will demonstrate the standard of conic sections by using conic sections (i.e., parabolas, circles and ellipses) to model real situations and interpret properties of the conic, such as the intercepts, foci, vertices, radius or center, with the given context.</p> <p>AdvA3.1 The student will demonstrate the standard of conic sections by solving problems with conic sections: parabolas – finding the vertex, intercepts, focus and directrix.</p> <p>AdvA3.2 The student will demonstrate the standard of conic sections by solving problems with conic sections: circles – finding the center and radius, including circles not centered at the origin.</p> <p>AdvA3.2 The student will demonstrate the standard of conic sections by solving problems with conic sections: ellipses – finding the foci and vertices [centered at the origin].</p> <p>AdvA3.2 The student will demonstrate the standard of conic sections by solving problems with conic sections: hyperboles – finding the foci, vertices and asymptotes [centered at the origin].</p>	$x^2 + y^2 = 8$ $y = \frac{1}{2}x + 1$ <p>3.1 c) See Application Pages</p> <p>3.2 a) Find the focus and directrix of <math>y = -2x^2</math>.</p> <p>3.2 b) Find the center and radius of <math>x^2 + 4x + y^2 = 21</math>.</p> <p>3.2 c) Find the vertices and foci of <math>\frac{x^2}{9} + \frac{y^2}{5} = 1</math>.</p> <p>3.2 d) Find the domain and range of <math>\frac{x^2}{4} - \frac{y^2}{9} = 1</math>.</p>
Worth Being Familiar With	
<p>AdvA3.2 The student will demonstrate the standard of conic sections by solving problems with conic sections understanding the properties of relations and functions.</p> <p>AdvA3.2 The student will demonstrate the standard of conic sections by solving problems with conic sections determining/understanding the relevance of the domain and range for each of these conic sections.</p>	

***Rational and Irrational Expressions:***

Enduring Understanding	ILLUSTRATIONS
<p><b>AdvA4 The student will simplify rational and irrational expressions.</b></p> <p>AdvA4.1 The student will demonstrate meeting the standard of simplifying rational and irrational expressions by adding, subtracting, multiplying, dividing, and reducing expressions.</p>	<p>4.1 Simplify:</p> $\frac{2x}{x^2 - 5x + 4} + \frac{3x}{x^2 - 4x} + 4$ <p>4.2 Simplify: <math>\frac{2 + \frac{3}{x}}{\frac{4}{x+1} + 5}</math></p> <p>4.3 Simplify by long division and by</p>

Important to Know and Do	synthetic division: $(10x^3 + 27x^2 + 14x + 5) \div (x^2 + 2x)$
<p>AdvA4.2 The student will demonstrate meeting the standard of simplifying rational and irrational expressions by simplifying complex fractions.</p> <p>AdvA4.3 The student will demonstrate meeting the standard of simplifying rational and irrational expressions by using synthetic and polynomial division.</p> <p>AdvA4.4 The student will demonstrate meeting the standard of simplifying rational and irrational expressions by factoring polynomials using quadratic trinomials, perfect square trinomials, the difference of two squares and the sum or difference of two cubes.</p> <p>AdvA4.5 The student will demonstrate meeting the standard of simplifying rational and irrational expressions by simplifying irrational expressions, including extracting perfect factors and rationalizing the denominator.</p> <p>AdvA4.6 The student will demonstrate meeting the standard of simplifying rational and irrational expressions by simplifying complex number expressions, including the use of the conjugate, and evaluating expressions containing <math>i</math>.</p>	<p>4.4 Factor completely:</p> <p>a) <math>10x^3 + 80y^3</math></p> <p>b) <math>6x^2 + 21x + 9</math></p> <p>c) <math>x^4 - 4x^2 + 3</math></p> <p>d) <math>4x^3 - 6x^2 + 10x - 15</math></p> <p>e) <math>x^3 + 8</math></p> <p>4.5 Simplify:</p> <p>a) <math>\sqrt{27x^3} + \sqrt{75x}</math>      b) <math>\frac{6x}{\sqrt{3x}}</math></p> <p>4.6 Simplify:</p> <p>a) <math>(2 + 3i)(4 + 5i) \frac{3i}{5 - 2i}</math></p>
Worth Being Familiar With	

***Probability, Sequences and Series:***

Enduring Understanding	ILLUSTRATIONS
<p><b>AdvA5 The student will understand probability, sequences and series.</b></p>	<p>5.1 a) How many permutations and combinations can be made of ten numbers, using any four of them?</p> <p>5.1 b) Which is most appropriate for a four-digit bar code, permutations or combinations? Explain your reasoning.</p> <p>5.2 Find the probability of rolling a product of 12 with a standard pair of dice.</p> <p>5.3 Use the Binomial Expansion Theorem to find the fourth term in <math>(x + 1)^{10}</math>.</p>

<b>Important to Know and Do</b>	5.4 Find the 101 <sup>st</sup> term in the sequence 4,7,10,... .
<p>AdvA5.1 The student will demonstrate meeting the standard of understanding probability, sequences and series by computing the number of permutations or combinations for a given situation and interpret the results within context.</p> <p>AdvA5.2 The student will demonstrate meeting the standard of understanding probability, sequences and series by computing simple probability with a combination of two independent events, such as rolling two dice.</p> <p>AdvA5.3 The student will demonstrate meeting the standard of understanding probability, sequences and series by using binomial distribution (i.e., the Binomial Expansion Theorem) to answer probability questions.</p> <p>AdvA5.4 The student will demonstrate meeting the standard of understanding probability, sequences and series by finding a specific term of an arithmetic or geometric sequence.</p> <p>AdvA5.5 The student will demonstrate meeting the standard of understanding probability, sequences and series by finding the sum of an arithmetic or geometric series through a specific term, and the sum of an infinite geometric series, when it exists.</p>	5.5 Find the sum of the first 101 terms in the series $4 + 7 + 10 + \dots$ .
<b>Worth Being Familiar With</b>	

*Algebraic Steps: Judging the Validity*

<b>Enduring Understanding</b>	<b>ILLUSTRATIONS</b>
<p><b>AdvA6 The student will use fundamental properties to judge the validity of algebraic steps.</b></p> <p>AdvA6.1 The student will demonstrate meeting the standard of using fundamental properties to judge the validity of algebraic steps by using properties of numbers to justify simple algebraic arguments.</p>	<p>6.1 Name the property to justify <math>3(x+1)+0 = 3(x+1)</math>.</p> <p>6.2 Use the order of operations to simplify <math>2 - 3(2^2 - 1)^2 \div 5 \cdot 10</math> .</p>
<b>Important to Know and Do</b>	6.3 For what values of $x$ will $\sqrt{2x-1}$ have real solutions?
AdvA6.2 The student will demonstrate meeting the standard of using fundamental properties to judge the validity of algebraic steps by deciding if the orders of operations have been correctly applied.	

<b>Worth Being Familiar With</b>	
AdvA6.3 The student will demonstrate meeting the standard of using fundamental properties to judge the validity of algebraic steps by determining if an algebraic statement is true always, sometimes or never.	

*Using the Graphing Utility:*

<b>Enduring Understanding</b>	<b>ILLUSTRATIONS</b>
<b>AdvA7 The student will use a graphing utility appropriately.</b>	
<b>Important to Know and Do</b>	
AdvA7.1 The student will demonstrate meeting the standard of using a graphing utility appropriately by using a graphing utility to find the real non-integer zeros of a parabola.	7.1 Find the zeros, to three decimal places, of the function $y = 2x^2 - 3x - 4$ .
AdvA7.2 The student will demonstrate meeting the standard of using a graphing utility appropriately by using a graphing utility to find the maximum or minimum of a parabola.	7.2 Find the vertex, to three decimal places, of the function $y = -3x^2 - 7x - 2$ .
AdvA7.3 The student will demonstrate meeting the standard of using a graphing utility appropriately by using a graphing utility to find the non-integer intersection of a line and a parabola.	7.3 Find the intersection, to three decimal places, of the functions $y = x^2 - 4x + 4$ $y = -x + 3$
<b>Worth Being Familiar With</b>	