

Algebra 2A and Honors Algebra 2A Exam Review

General instructions for the exam:

- Students may use a calculator.
- If a calculator is used to find points on a graph, the appropriate calculator function (i.e. zero, intersect, minimum or maximum) should be used. The trace function should NOT be used.
- Decimal approximations must be accurate to three places after the decimal point.
- Unless otherwise specified, the domain of any function f is assumed to be the set of all real numbers x for which $f(x)$ is a real number.

Formulas provided on the exam:

Quadratic Formula: If $ax^2 + bx + c = 0$, then $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Factoring: $a^3 + b^3 = (a + b)(a^2 - ab + b^2)$ $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$

Greatest Integer Function: $f(x) = [x]$

Review questions in bold italics are for the additional Honors Algebra 2 indicators.

Student Produced Responses—The GRID-IN Section

The Algebra 2 and Honors Algebra 2 exams will use the SAT grid format. Following are directions for using this grid. Review problems 54 to 59 provide practice using this grid.

- The grid has four columns. Answers for student produced response questions will non-negative numbers equal to or less than 9999.
- Write your answer in the boxes at the top of the columns to help you fill in the correct circles. You will receive credit *only* if the circles are filled in correctly.
- For answers that have less than 4 places, it does not matter where you begin writing the answer. As long as you grid the answer completely and correctly, you will receive credit. For example, you may grid 51 as follows:

				column #:	1	2	3	4
		5	1					
/	/			← fraction bar				
•	•	•	•		5	1		
	0	0	0		0	0	0	0
①	①	①	●		①	●	①	①
②	②	②	②		②	②	②	②
③	③	③	③		③	③	③	③
④	④	④	④		④	④	④	④
⑤	⑤	●	⑤		⑤	●	⑤	⑤
⑥	⑥	⑥	⑥		⑥	⑥	⑥	⑥
⑦	⑦	⑦	⑦		⑦	⑦	⑦	⑦
⑧	⑧	⑧	⑧		⑧	⑧	⑧	⑧
⑨	⑨	⑨	⑨		⑨	⑨	⑨	⑨

- Note that if the answer is 0, it must be grid in column 2, 3, or 4. Zero has been omitted from column 1 so that the most accurate values for decimal answers can be grid. For example, an answer of $\frac{1}{8}$ may be grid as 1 / 8 or as .125, but NOT as 0.12.
- You can grid both proper and improper fractions, but NOT mixed numbers. For example, an answer of $5\frac{3}{4}$ must be entered as 23/4 or as 5.75. If you were to grid $5\frac{3}{4}$ the answer would be read as $\frac{53}{4}$, which is wrong. Note that since 5.75 *does* fit in the grid, 5.7 or 5.8 would NOT be given credit.
- If the answer you grid is a repeating decimal, *you must grid the most accurate possible decimal*. If you obtain a decimal answer with *more* digits than the grid can accommodate, it may be either rounded or truncated. For example, 0.566666... may be grid as .566 or as .567. A less accurate value, such as 5.6 or 5.7 would NOT be counted as correct.

Unit 1: Equations and Functions

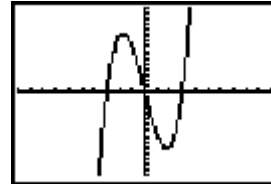
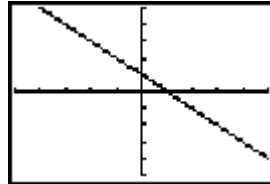
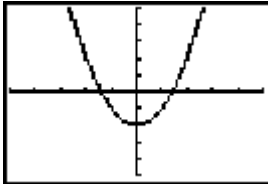
Directions for items 1 to 10: Use the following functions, $f(x)$, $g(x)$, and $h(x)$, for problems 1-10.

$$f(x) = x^2 - 2$$

$$g(x) = -x + 1$$

$$h(x) = x^3 - 9x$$

For each graph, the scale is one unit per tick mark.



1. Give the domain and range of each function. Determine whether each function is 1 to 1.

Function	Domain	Range	1 to 1?
$f(x)$			
$g(x)$			
$h(x)$			

2. Find the indicated values:

$$f(1) \underline{\hspace{1cm}} \quad g(5) \underline{\hspace{1cm}} \quad f(g(7)) \underline{\hspace{1cm}} \quad g(f(-3)) \underline{\hspace{1cm}}$$

$$f(g(x)) \underline{\hspace{1cm}} \quad g(f(x)) \underline{\hspace{1cm}} \quad h(5) \underline{\hspace{1cm}} \quad g(h(3)) \underline{\hspace{1cm}} \quad g(h(x)) \underline{\hspace{1cm}}$$

3. Name the intervals of the domain for which each function increases or decreases and indicate its end behaviors.

Function	Increasing	Decreasing	Left end behavior as $x \rightarrow -\infty$	Right end behavior as $x \rightarrow \infty$
$f(x)$				
$g(x)$				
$h(x)$				

4. Perform the following operations

a. $f(x) + g(x)$

b. $f(x) - g(x)$

c. $f(x)g(x)$

d. $\frac{f(x)}{g(x)}$

5. What values are restricted from the domain of $\frac{f(x)}{g(x)}$?

Directions for items 1 to 10: Provide the requested information in problems 1-10 using the following functions for $f(x)$, $g(x)$, and $h(x)$. Use interval notation where appropriate.

$$f(x) = x^2 - 2$$

$$g(x) = -x + 1$$

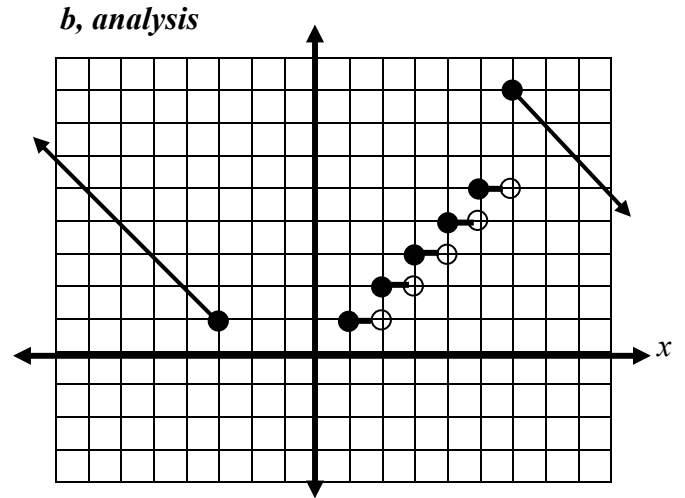
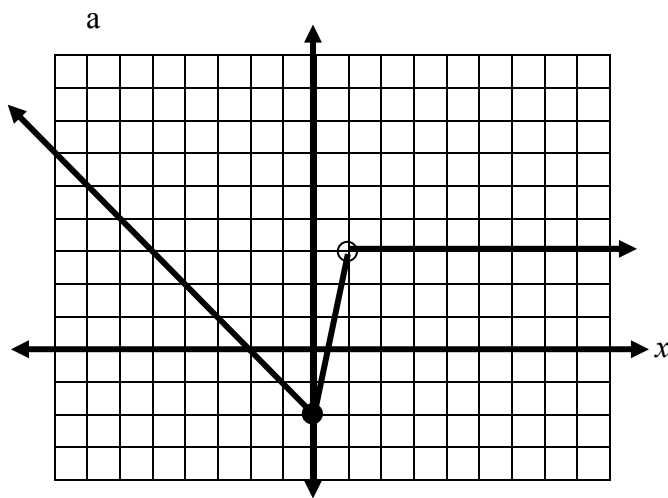
$$h(x) = x^3 - 9x$$

6. a. If the graph of $f(x)$ is translated vertically down 5 units, what is the new equation for the graph?
- b. If the graph of $g(x)$ is translated horizontally left 6 units, what is the new equation for the graph?
7. The graph of $m(x) = x^2$ is transformed as described. Write a representation for the new function, $j(x)$.
- a. Translated three units to the left and one unit down
- b. Stretched vertically by a factor of 4 and translated one unit up.
8. Write the equation for the axis of symmetry for the graph of $f(x)$.
9. Is $g(x)$ the inverse function of $f(x)$? Explain your answer.
10. State the local maximum and/or minimum values for the functions.

Function	Local Maximum Value	Local Minimum Value
$f(x)$		
$g(x)$		
$h(x)$		

11. If $k(x) = 4x + 2$, then the inverse function $k^{-1}(x) = \underline{\hspace{2cm}}$
12. Let $m(x) = \{(0,1), (1,2), (3,4), (-5,6)\}$, then the inverse function $m^{-1}(x) =$
13. You have a coupon for \$40 off the price of a VCR. When you arrive at the store, you find that all VCRs are 20% off. Represent the cost $D(x)$ for the VCR you chose if the 20% is taken from the original price x , and then the coupon is applied. Then find the model $C(x)$ if the 20% discount is applied after the coupon reduction is made. Which model gives the lowest cost to the consumer? What are the two costs for a VCR that originally sold for \$535.00?
14. Let $f(x) = \frac{1}{x}$ and $g(x) = 2x - 5$. Determine the following functions **and their domains**:
- a. $f(g(x))$
- b. $g(f(x))$

15. Write piece-wise functions to represent the graphs shown below. Each grid mark represents one unit.



16. Graph each of the following functions without using a calculator.

a. $f(x) = \begin{cases} x+5 & \text{if } x \leq -2 \\ -2x-1 & \text{if } -2 < x \leq 2 \\ |2x-9| & \text{if } x > 2 \end{cases}$

b. $f(x) = \begin{cases} -5, & x < -3 \\ x, & -3 \leq x < 2 \\ 2x+1, & x \geq 2 \end{cases}$

c. $f(x) = |x+5| - 3$

d. $f(x) = [x]$

e. $f(x) = 2|x-3|$

17. When ordering items from a catalog, the buyer has the option of having items gift-wrapped. The shipping charge for every order is \$12. The charge to have items gift-wrapped depends on the number of items, as shown in the chart below. Represent the shipping and gift-wrapping charges as a piece-wise function.

Number of Items to be Gift-Wrapped	Gift-Wrapping Charge Per Item
None	\$0
less than 5	\$5.00
5 to 9	\$4.50
10 or more	\$5.00

18. If $f(x) = 2x+3$ and $g(x) = x-1$, determine the domain of the following functions.

a. $\frac{f(x)}{g(x)}$

b. $\frac{g(x)}{f(x)}$

19. Determine the inverse, f^{-1} , of each function. State whether f^{-1} is a function.

a. $f(x) = 5x+9$

b. $f(x) = 10-3x$

20. For each function listed below, modify the domain so that the inverse will be a function.

a. $f(x) = \frac{3}{4}x^2$

b. $f(x) = 5x + 9$

c. $f(x) = (x+1)^2$

21. Determine the inverse of the function defined by the following table. Is the inverse a function?

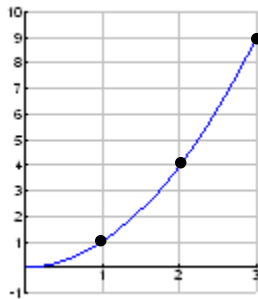
x	-1	0	1	2
y	1	2	3	3

22. Show three ways to demonstrate that f and g are inverse functions.

$$f(x) = 2x - 1 \quad g(x) = \frac{1}{2}x + \frac{1}{2}$$

23. For the graph of each function below, graph the inverse function.

a.



b.



c.



Unit 2: Linear Systems and Matrices

24. State the dimensions of each matrix.

a. $\begin{bmatrix} 2 & 1 & -7 \\ 1 & 5 & 3 \end{bmatrix}$

b. $\begin{bmatrix} 4 & 5 & -9 & 7 \\ 1 & 4 & 5 & 8 \\ -2 & 6 & -10 & 1 \end{bmatrix}$

25. Perform the indicated matrix operations:

a. $\begin{bmatrix} 0 & 1 \\ 2 & 9 \end{bmatrix} \begin{bmatrix} 2 & -7 \\ 5 & -1 \end{bmatrix}$

b. $\begin{bmatrix} 9 & 0 \\ -4 & 3 \\ 1 & 2 \end{bmatrix} \begin{bmatrix} 2 & -7 \\ 5 & -1 \end{bmatrix}$

c. $\det \begin{bmatrix} 3 & x \\ -5 & y \end{bmatrix}$

26. Write each system of equations in matrix form. Solve each system of equations.

a. $\begin{cases} 2x - 5y + 4z = 8 \\ 2x + y + z = -12 \\ x - 3y + 2z = 7 \end{cases}$

b. $\begin{cases} x + 2y + z = 4 \\ y = x - 3 \\ z = 2x \end{cases}$

c. $\begin{cases} 9y + 2z = 14 \\ 3x + 2y + z = 5 \\ x - y = -1 \end{cases}$

27. The dimensions of matrix A are (2×2) . The dimensions of matrix B are (2×4) . State whether the matrices AB and BA exist. If so, state their dimensions.

28. Without using a calculator, evaluate the determinants of the following matrices. State whether each matrix has a multiplicative inverse and explain your answers.

a. $\begin{bmatrix} a & 0 \\ 0 & a \end{bmatrix}$

b. $\begin{bmatrix} -2 & 2 \\ 5 & -4 \end{bmatrix}$

c. $\begin{bmatrix} 4 & 2 \\ 2 & 4 \end{bmatrix}$

29. For what value of y will the determinant of the following matrix equal 15? $\begin{bmatrix} y & 8 \\ -2 & 30 \end{bmatrix}$

30. For what value of x will the following matrix NOT have an inverse? $\begin{bmatrix} 4 & 7 \\ x & 5 \end{bmatrix}$

31. Barry's Burgers offers three different types of burgers at three different prices. The types are the Hamburger, the Cheeseburger, and the Barry Burger. The chess team went to Barry's on three different occasions and ordered different burgers. The first time they went, 3 Hamburgers, 5 Cheeseburgers, and 6 BarryBurgers cost \$25.24. The second time, 2 Hamburgers, 7 Cheeseburgers and 5 BarryBurgers cost \$25.68. The last time, 4 Hamburgers, 4 Cheeseburgers, and 7 BarryBurgers cost \$26.59. What is the price of each type of burger?
32. Barbara's Chicken Crab Jumble is the favorite meal at her restaurant. She makes a total of 36 pounds of it in a large pot every day. The ingredients cost her \$59.00 per day. The total amount of protein in the pot of Chicken Crab Jumble is 1700 grams. Barbara pays \$1.50 per pound of chicken, \$6.00 per pound of crab, and \$0.40 per pound of rice. Each pound of chicken contains 100 grams of protein, each pound of crab contains 50 grams of protein, and each pound of rice contains 20 grams of protein. How many pounds of each ingredient does Barbara use each day to make the large pot of Chicken Crab Jumble?
33. Sam went shopping. At Store 1 he spent \$154.50 and purchased 3 shirts, 2 pairs of pants, and one pair of socks. At Store 2 he spent \$216.50 and purchased 2 shirts, 4 pairs of pants, and 5 pairs of socks. At Store 3 he spent \$183.00 and purchased 4 shirts, 1 pair of pants, and 6 pairs of socks. Each item costs the same price at each store. For example, all shirts cost the same, no matter where they are purchased. Determine the cost of each item, one shirt, one pair of pants, and one pair of socks.

Unit 3: Polynomial Functions

34. Determine the degree of the polynomial functions that would model the following data:

a.

x	-1	0	1	2	3	4	5
y	0	2	4	18	56	130	252

b.

x	-2	-1	0	1	2	3	4
y	420	78	0	36	84	90	48

35. **A quadratic function has the values: $f(0) = -9$, $f(3) = -6$, $f(-2) = -1$**
- Determine the equation of the quadratic function containing the points.**
 - Determine the vertex and the axis of symmetry.**
 - Determine the zeroes of the function.**
 - Find $f(5)$**
 - Find x if $f(x) = -1$**
36. An arrow is shot from a height of 32 feet with an initial velocity of 56 ft/sec. The equation of the height $h(t)$ (in feet) of the arrow at time t (in seconds) is $h(t) = -16t^2 + 56t + 32$.
- When will the arrow hit the ground?
 - How high will the arrow be at $t = 2$ seconds?
 - What is the maximum height the arrow will reach?
37. Determine the number of real roots for each of the following equations:
- $x^2 - 4x - 6 = 0$
 - $(x - 5)^2 = 0$
 - $2x^2 + 5x = -11$
 - $3x^2 - 4x = 0$
38. Graph each number on the complex plane. **Determine the absolute value of each.**
- $4 + 3i$
 - $-5 + 2i$
 - $6i$
 - $5 - 6i$
 - -3
39. Determine all the zeros of each equation.
- $4x^2 = 7$
 - $x^2 = -64x$
 - $2x^2 + x + 7 = 0$
 - $x^2 - 3x + 7 = 0$
40. Perform the indicated operations and simplify all answers.
- $(4 + 5i) + (9 - 3i)$
 - $2(5i) - 7(17 + 5i)$
 - $(4 + 3i)(7 - 5i)$
 - $(6 - 5i)^2$
 - $\frac{2 - 5i}{3i}$
 - $\frac{4 + 5i}{1 - 2i}$
41. Factor completely:
- $x^3 - 25x$
 - $x^3 - 125$
 - $27x^3 + 8$
 - $x^4 - 16$
42. For the following: state the number of zeros, graph to determine the number of real zeros, and determine all zeros of the function.
- $f(x) = 3x^4 - 11x^3 + 10x - 4$
 - $f(x) = x^3 + 6x^2 + x + 6$

43. Given $f(x) = x^3 + 3x^2 - x - 3$

- Find $f(0)$ and $f(-2)$
- Find the zeroes of the function and sketch a graph.
- Complete: As $x \rightarrow \infty$, $f(x) \rightarrow$ _____
- Complete: As $x \rightarrow -\infty$, $f(x) \rightarrow$ _____

44. The zeros of $f(x)$ are -1 , 3 , and 5 , and the leading coefficient is one. Find a possible function $f(x)$.45. **Find a polynomial function with zeros $4, 5i, -5i$ and with a leading coefficient of one.**

46. Using the rational root (zero) theorem, list the possible rational zeros of

$$f(x) = 5x^4 - 7x^2 + 4.$$

47. Determine a function that would model the following data and state the behavior of each function as $x \rightarrow \infty$, $f(x) \rightarrow$ _____ and as $x \rightarrow -\infty$, $f(x) \rightarrow$ _____ .

a.

x	-1	0	1	2	3	4	5
y	0	2	4	18	56	130	252

b.

x	-2	-1	0	1	2	3	4
y	420	78	0	36	84	90	48

c.

x	-1	0	1	2	3
y	-3.5	-2	0.5	4	8.5

48. For each function listed, determine the properties listed in the chart.

Domain	Range
x -intercepts	y -intercepts
Intervals where increasing	Intervals where decreasing
Left-end behavior	Right-end behavior
Local maximum values	Local minimum values
One-to-One?	

a. $f(x) = x^4 - x^3 - x^2 - x - 2$

b. $f(x) = x^3 - 4x + 1$

c. $f(x) = -x^3 + x^2 - 2x + 3$

49. J.S.B. is selling tickets for his next concert. He has learned that the predicted net income from a concert is related to the ticket price. The relationship can be modeled by the function $f(x) = -25x^2 + 2000x - 3750$ where x represents the price per ticket, in dollars, and $f(x)$ represents the income, in dollars, from the concert.
- Sketch a graph of this function.
 - What is the maximum point of the graph?
 - What should J.S.B. charge per ticket to obtain the greatest net income from the concert?
50. Graph the polynomial function. Then solve the related polynomial inequality.
- $f(x) = x^3 - 9x$
 $x^3 - 9x \leq 0$
 - $g(x) = x^4 - 17x^2 + 16$
 $x^4 - 17x^2 \geq -16$
51. Solve the following quadratic inequalities.
- $x^2 + 4x - 21 < 0$
 - $x^2 + 7x \geq -10$
 - $x^2 - 25 \leq 0$
52. a. $0 = x^4 + 4x^3 - x^2 - 16x - 12$ has solutions of $-3, -2, -1, 2$
- Write the polynomial $x^4 + 4x^3 - x^2 - 16x - 12$ in factored form.
 - Solve the inequality $x^4 + 4x^3 - x^2 - 16x - 12 \geq 0$ algebraically.**
- b. $0 = x^3 + 11x^2 + 23x - 35$ has solutions of $-7, -5, 1$
- Write the polynomial $x^3 + 11x^2 + 23x - 35$ in factored form.
 - Solve the inequality $x^3 + 11x^2 + 23x - 35 \leq 0$ algebraically.**
53. The table below has columns for subsets of numbers by type. For each row, place a check in the column(s) for which the given number is a member of that subset.

Number	Rational	Irrational	Real	Pure Imaginary	Complex
-18					
$3.\overline{17}$					
$\frac{2}{3}$					
$\sqrt{25}$					
$\sqrt{140}$					
$\sqrt{-8}$					
$3i$					
$-2 + 7i$					

Practice Student Produced Response questions:

54. In the xy -plane, the polynomial $f(x) = (x-1)^3 - 8$ crosses the x -axis at point (a, b) . What is the value of a ?

54

	7	7	
	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

55. What is the slope of the graph of the function $f(x) = \frac{15}{28}x + 17$?

55

	7	7	
	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

56. How many zeros will the function $g(x) = 5x^6 - 3x^4 + x^3 - 2$ have?

56

	7	7	
	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

57. What is the absolute value (magnitude) of $4i - 3$?

57

	7	7	
	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

58. What is the value of $|6i + 7|$?

58

	7	7	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

59. If r is a root of $f(x) = x^2 - 4$ and t is a root of $g(x) = x^2 - 25$, what is the value of $|r - ti|$?

59

	7	7	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9