Algebra 2 Final Exam Review

For #1-2, solve each equation.

1. $3(x + 2) + 2(x - 4) + 1 = -26$

2. $3(2x - 1) = 5(x + 2) - 2$

For #3-4, simplify each expression.

3. $\dfrac{24x^4 y^3}{20x^2 y^5}$

4. $\dfrac{30a^4 b^3 c^5}{15a^3 c}$

For #5-6, solve each inequality. Graph your answer and write your answer in interval notation.

5. $2(6 + 4x) \geq 12 - 8x$
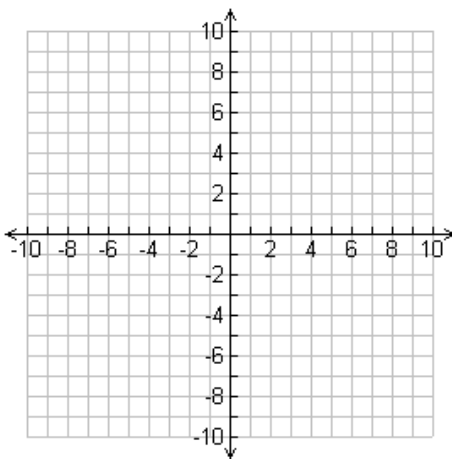
6. $-5(2x + 7) + x < -x - 11$

For #7-8, solve each system of equations.

7. $-3x + 2y = 17$
   $x - 5y = -10$

8. $4x + 6y = 22$
   $-2x + 4y = 10$

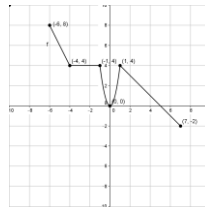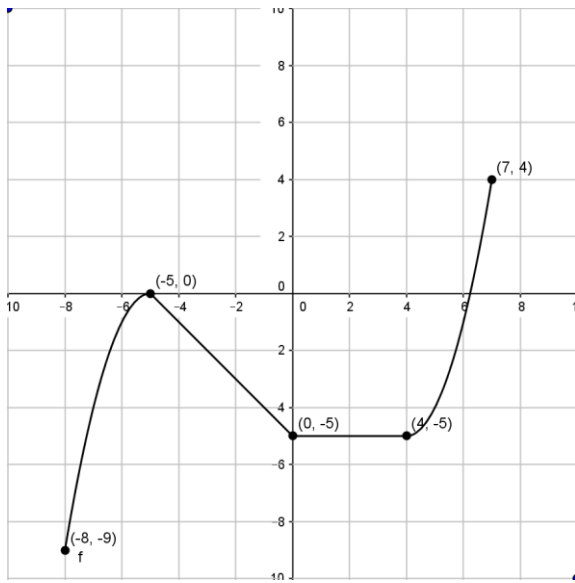**For #9-10, graph each line.**

9. $5x - y = 10$

10. $5x + 4y = 20$
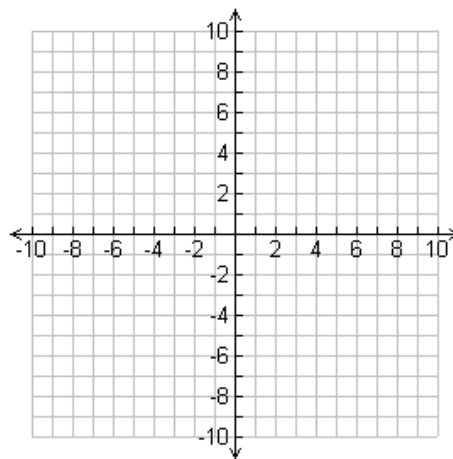
For #11-12, use a table to perform each transformation of $y = f(x)$. Graph your answers on the same coordinate plane as the original function.

11. Reflect over the x-axis, down 3

12. Vertical shrink by ½, left 4

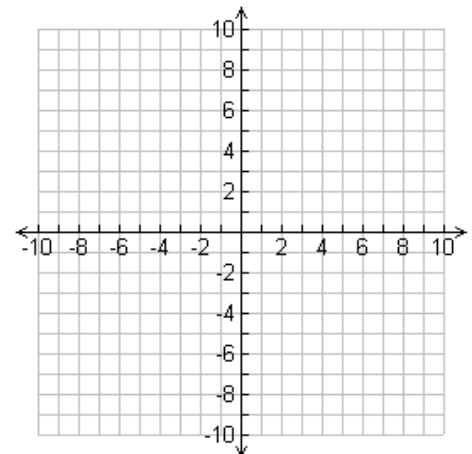For #13-14, graph the data. Determine the parent function, domain and range.

13.

x	-2	-1	0	1	2
y	8	2	0	2	8

14.

x	-2	-1	0	1	2
y	8	1	0	-1	-8
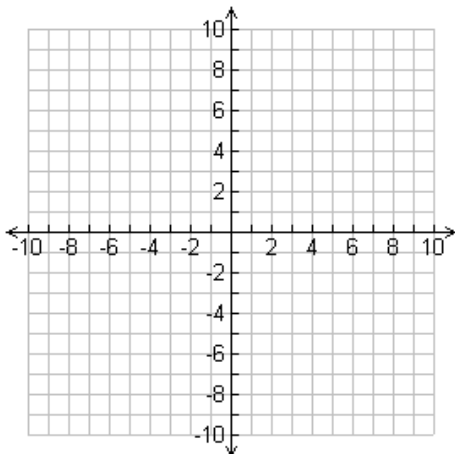
For #15-16, graph the following on your graphing calculator. Determine (a) the parent function (b) any transformations (c) domain and (d) range.

15. $g(x) = (x-2)^3 - 3$

16. $g(x) = (x+4)^2 - 6$

For #17, solve the application problem.

17. The success of a shopping center can be represented as a function of the distance (in miles) from the center of the population and the number of clients **(in hundreds of people)** who will visit. The data is given in the table below:

# of costumers (x)	8	7	6	4	2	1
Distance (y)	5	19	25	23	34	40

    a. State the type of correlation

    b. Find the equation of the line of best fit.

    c. Find the correlation coefficient.

    d. If the mall is located 2 miles from the center of the population, how many customers should the shopping center expect?

    e. To receive 500 customers, at what distance from the center of the population should the shopping center be located?

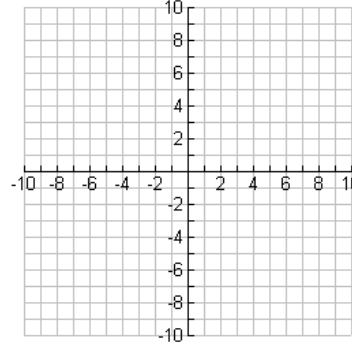18. $g(x) = 2x^2 - 8x + 5$
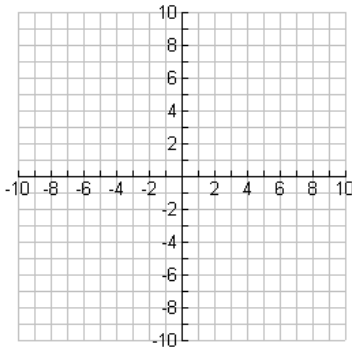
Up/Down _____

Max/Min _____

AOS _____

Vertex _____

Roots _____

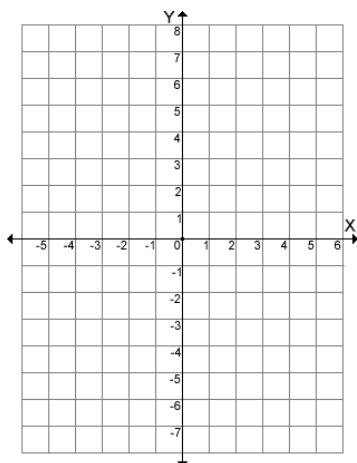19. $g(x) = -2(x - 2)^2 + 10$

Up/Down _____

Max/Min _____

AOS _____

Vertex _____

Roots _____

20. $f(x) = (x - 1)(x - 5)$

Up/Down _____

Max/Min _____

AOS _____

Vertex _____

Roots _____

Find the zeroes of each function by factoring.

21. $f(x) = x^2 + 2x - 35$

22. $f(x) = x^2 - 8x - 9$

23. $f(x) = 2x^2 - 11x + 9$

Write a quadratic function in standard form for each given set of zeros.

24. -5 and 1

25. ½ and -2

Use complete the square method to find the zeros of the following functions

26. $x^2 + 8x + 20 = 0$

27. $x^2 - 8x - 17 = 0$

Write in vertex form and identify the vertex.

28. f(x) = x^2 -2x + 17

29. f(x) = 4x^2 -24x + 31

Simplify the square root.

30. $\sqrt{-48}$

31. $-3\sqrt{-128}$

32. $\sqrt{-256}$

Perform each indicated operation and write the result in the form a+bi.

33. $(3 - 5i) + (8 - 5i)$

34. $(9 + 7i) - (9 + 2i)$

35. $(4 - 4i)(2 + 9i)$

36. i^{35}

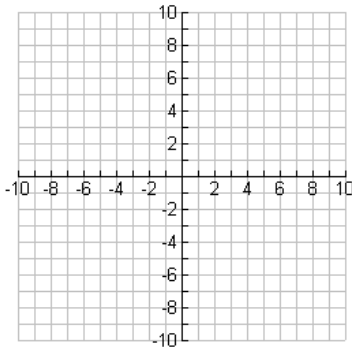37. $\frac{2+5i}{6i}$

38. $\frac{3-5i}{3+i}$

For #22-23, find the discriminant, state the type and number of solutions and solve using the Quadratic Formula.

39. $x^2 - 10x + 3$

40. $2x^2 - 10x + 18 = 0$

Graph each inequality.

41. $y \geq x^2 - 4x + 4$
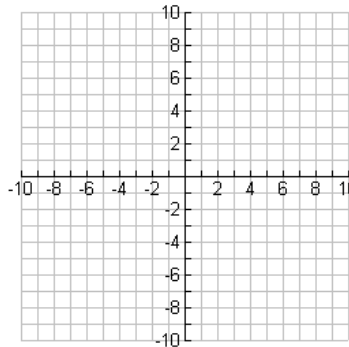
Up/Down _____

Max/Min _____

AOS _____

Vertex _____

Roots _____

Test point _____

42. $y > -(x - 3)^2$

Up/Down _____

Max/Min _____

AOS _____

Vertex _____

Roots _____

Test point _____

For #26-28, solve each inequality algebraically. Write your answer in interval notation.

43. $x^2 + 13x + 20 < -2$

44. $x^2 - 11x \geq -10$

45. $x^2 + 6x + 3 > 10$

Let $f(x) = x^2$, describe the transformations.

46. $g(x) = -(x + 3)^2$

47. $g(x) = 2x^2 - 5$

Solve each system of equations.

48. $\begin{cases} y = 2x^2 - 5x - 20 \\ \quad y = 3x + 22 \end{cases}$

49. $\begin{cases} y = x^2 + 2x - 4 \\ \quad y = 2x + 5 \end{cases}$

Solve the application problem.

50. Tessa is running a chemical reaction that can be models by a quadratic function. When she begins the reaction there are 20 grams of sodium chloride present. At 2 minutes there are 48 grams of sodium chloride. At 5 minutes there are 60 grams of sodium chloride. Write a quadratic model for her data. At what time will the sodium chloride be used up in the reaction?

(HINT: Make your own table!)

51. A stuntwoman jumps from a building 73 feet high and lands on an air bag that is 9 feet tall. Her height above the ground h in feet can be modeled by $h(t) = 73 - 16t^2$, where t is the time in seconds.
    (a) How many seconds will the stuntwoman fall before touching the air bag?

    (b) Suppose the stuntwoman jumps from a building that is half as tall. Will she be in the air for half as long? Explain?

Rewrite each polynomial in standard form. Then identify the leading coefficient, degree and number of terms. Name each polynomial.

52. $7x^2 + 4x^5 - 3$ _____
    Leading coefficient _____
    Degree _____ Number of Terms _____
    Name _____

53. $2 + 6x^3 + 2x - x$ _____
    Leading coefficient _____
    Degree _____ Number of Terms _____
    Name _____

54. $10x - 3 - 2x^2 - 9x^3$ _____
    Leading coefficient _____
    Degree _____ Number of Terms _____
    Name _____

55. $-7x^2 - 4x$ _____
    Leading coefficient _____
    Degree _____ Number of Terms _____
    Name _____

Add or subtract. Write your answer in standard form.

56. $(4x^2 + 3) + (5x^2 + 4)$ 57. $(10x^3 - 7x^2) - (3x^3 + 2x^2 + 4)$ 58. $(2 + 2x^4 - x) - (7 + x^4 + 3x)$

Find each product.

59. $3y(2x^2 + 5xy)$ 60. $8(2x + 2)$ 61. $(a + b)(4ab + b^2)$

62. $(8m + 2)(7m - 3)$ 63. $\left(3x + \frac{1}{4}\right)^2$ 64. $(3x - 2)(2x^3 - x^2 + 4x + 4)$

65. $(p^2 - p + 1)(6p^2 - 8p - 3)$ 66. $(b - 5)^3$ 67. $(x + 3y)^3$

Factor each polynomial completely.

68. $3x^3 + 6x^2 + 5x + 10$ 69. $21v^3 + 56v^2 - 12v - 32$ 70. $12a^3 - 20a^2 + 21a - 35$

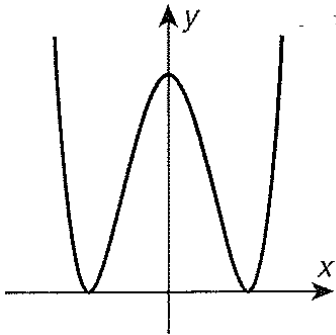71. $21x^3 - 7x^2 + 6x - 2$ 72. $125 + 8u^3$ 73. $374x^4 + 81x$

74. $125 - 27u^3$ 75. $8x^4 + x$
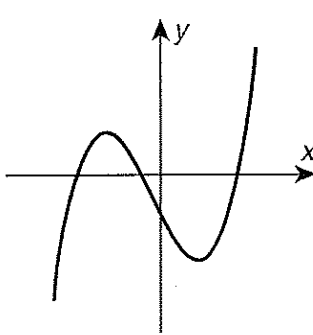
Identify and the end behavior of the function.

76.

77.

78.

As $x \to \infty, f(x) \to$ _____   As $x \to \infty, f(x) \to$ _____   As $x \to \infty, f(x) \to$ _____
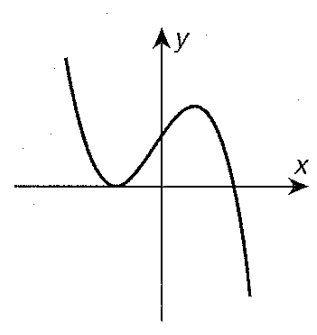
As $x \to \infty, f(x) \to$ _____   As $x \to \infty, f(x) \to$ _____   As $x \to \infty, f(x) \to$ _____

Simplify each expression. Assume all variables are positive.

79. $\sqrt[3]{125x^9}$

80. $\sqrt[4]{\dfrac{x^8}{81}}$

81. $\sqrt[3]{\dfrac{64x^3}{8}}$

Write each expression in radical form and simplify.

82. $64^{\frac{5}{6}}$

83. $27^{\frac{2}{3}}$

84. $(-8)^{\frac{4}{3}}$

Write each expression with rational exponents.

85. $\sqrt[5]{51^4}$

86. $\left(\sqrt{169}\right)^3$

87. $\sqrt[7]{36^{14}}$

Simplify each expression.

88. $4^{\frac{3}{2}} \cdot 4^{\frac{5}{2}}$

89. $\dfrac{27^{\frac{4}{3}}}{27^{\frac{2}{3}}}$

90. $\left(125^{\frac{2}{3}}\right)^{\frac{1}{2}}$

91. $(27 \cdot 64)^{\frac{2}{3}}$

92. $\left(\dfrac{1}{243}\right)^{\frac{1}{5}}$

93. $\left(-27x^6\right)^{\frac{1}{3}}$

Solve each equation.

94. $\sqrt{x+6}=7$

95. $\sqrt{5x}=10$

96. $\sqrt{2x+5}=\sqrt{3x-1}$

97. $\sqrt{x+4}=3\sqrt{x}$

98. $\sqrt[3]{x-6}=\sqrt[3]{3x+24}$

99. $3\sqrt[3]{x}=\sqrt[3]{7x+5}$

100. $\sqrt{-14x+2}=x-3$

101. $(x+4)^{\frac{1}{2}}=6$

102. $4(x-3)^{\frac{1}{2}}=8$

103. $4(x-12)^{\frac{1}{3}}=-16$

Solve each inequality; write the result in interval notation.

104. $\sqrt{3x+6}\le 3$

105. $\sqrt{x-4}+3>9$

106. $\sqrt{x+7}\ge\sqrt{2x-1}$

107. $\sqrt{2x-7}>9$

Solve each equation.
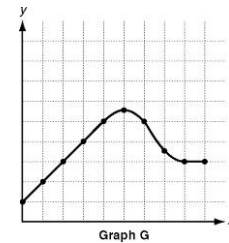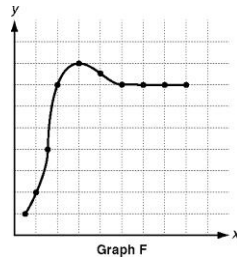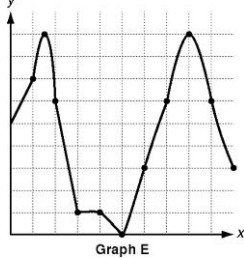
108.

$$\frac{6}{x} = 1$$

109.

$$\frac{3x+5}{x-5}$$

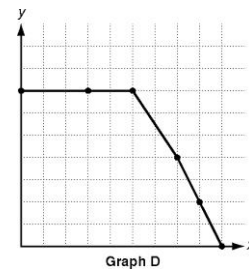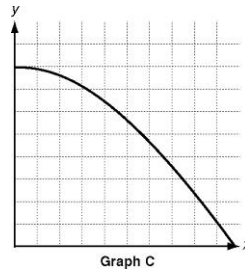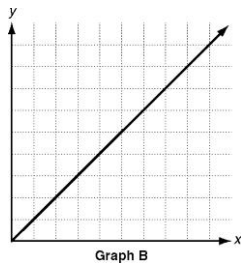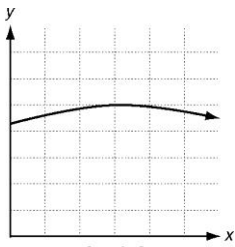110.

$$\frac{2x+2}{x+2}$$

111.

$$\frac{x}{2} = \frac{2x}{2x+8}$$

For #1-7, match each situation to its corresponding graph.

Graph A Graph B Graph C Graph D

Graph E Graph F Graph G

1. A bowling ball rolls down the alley and drops into a trough behind the pins.

2. As a flower vase is filled with water, the level of the water rises.

3. A football is kicked and then caught by a person who runs down the football field with it.

4. The sales of wide screen televisions increases rapidly, peaks, and then levels off.

5. Ice cream sales were steady all day at the music festival.

6. A restaurant opens late in the morning, experiences a lunchtime rush, and then empties right before the dinner rush.

7. The noise level of traffic decreases after the evening rush hour.

Evaluate each piecewise function for x = -8 and x = 5.

1. $f(x) = \begin{cases} 2x & \text{if } x < 0 \\ 0 & \text{if } x \geq 0 \end{cases}$

2. $g(x) = \begin{cases} 2 - x & \text{if } x \leq 5 \\ -x^2 & \text{if } 5 < x < 8 \\ 6 & \text{if } 8 \leq x \end{cases}$

3. $h(x) = \begin{cases} 2x + 4 & \text{if } x \leq -8 \\ -1 & \text{if } -8 < x < 5 \\ x^2 & \text{if } 5 \leq x \end{cases}$

4. $k(x) = \begin{cases} 15 & \text{if } x \leq -5 \\ x & \text{if } -5 < x < 1 \\ 7 - \dfrac{x}{2} & \text{if } 1 < x \end{cases}$

$$f(x) = \frac{1}{2x} \qquad g(x) = x^2 \qquad h(x) = x - 8 \qquad k(x) = \sqrt{x}$$

Find each function _and state any domain restrictions._

5. $(gk)(x)$

6. $(g + h)(x)$

7. $(g - h)(x)$

8. $(fg)(x)$

9. $(gh)(x)$

10. $\left(\dfrac{f}{g}\right)(x)$

Find each value.

11. $g(k(9))$

12. $h(g(-3))$

13. $g(h(-3))$

14. $k(h(12))$

15. $f(g(4))$

16. $f(h(1))$

Write each composite function and _state any domain restrictions._

17. $f(g(x))$

18. $h(g(x))$

19. $f(k(x))$

20. $h(k(x))$

21. $k(g(x))$

22. $k(h(x))$

Make a table and equation for the situation.

23. A bicyclist begins a trip of 104 miles. The bicyclist averages 8 miles per hour including stops. Create a table, graph, and equation to represent the distance the bicyclist has left to travel with relation to time. Find the total time it takes for the bicyclist to complete the trip.

Graph the piecewise function.

24. $f(x) = \begin{cases} -2x + 6, & if \ x < -1 \\ -5x^2, & if \ x \geq -1 \end{cases}$
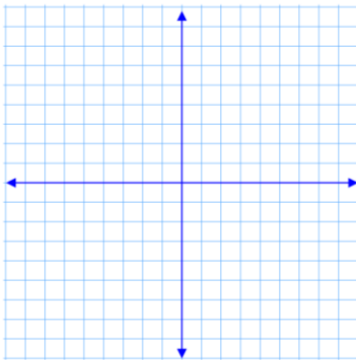
25. $f(x) = \begin{cases} -3, & if \ x < -2 \\ 0, & if \ -2 \leq x \leq 2. \\ 6, & if \ x > 2 \end{cases}$
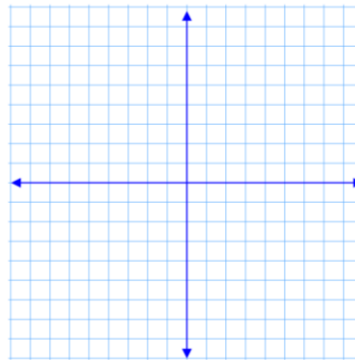
Compare the functions using end behavior. (You will need to put the equations in your calculator.)

26. $f(x) = -2x^2$ & $g(x) = 2x^4 - 12x^2 + 9$

27. $f(x) = -3^x$ & $g(x) = x^3$

28. The cost of renting a pedal boat is shown for Company A and Company B below. Compare the average rates of change and explain what the difference in rate of change represents.

Company B Cost of Rental per Hour

Data points: $8.00, $13.50, $19.00, $24.50, $30.00, $35.50

X-axis: Number of hours (0–7)
Y-axis: Cost ($0–$40)

Company A

Number of Hours	Cost
0.5	$7.25
1.0	$8.50
1.5	$9.75
2.0	$11.00
2.5	$12.25
3.0	$13.50

Find the first 5 terms in the sequence:

29. $a_1 = 1$, $a_n = 6 - 2(a_{n-1})$

30. $a_n = n^2 - 2n$

Find the first five terms of each arithmetic sequence.

31. $a_1 = -5.5$, $d = -3$

Find the indicated term of each arithmetic sequence.

32. $a_1 = 40$, $d = 3$, $n = 17$

Find S_n for each arithmetic series described.

33. $a_1 = 3$, $a_n = 20$, $n = 6$

34. $\displaystyle\sum_{n=1}^{13}(n+2)$

Find the next two terms of each geometric sequence.

35. $-9, 27, -81, ...$

Find the indicated term of each geometric sequence.

36. $a_1 = 5$, $r = 7$, $n = 6$

Find S_n for each geometric series described.

37. $a_1 = 2$, $a_n = 486$, $r = 3$

38. $\displaystyle\sum_{n=1}^{9}2(-3)^{n-1}$

39. $\displaystyle\sum_{k=1}^{\infty}\frac{1}{4}\left(\frac{4}{3}\right)^{k}$