Name: Key Date: _____ Period: ____

Algebra AB Final Review

Finish the following Exponential Properties

Product
$x^a \cdot x^b =$
x^{a+b}

Power
$(x^a)^b =$
x^{ab}

Product to a Power
$(x^a y^b)^c =$
$x^{ac} y^{bc}$

Quotient
$\frac{x^a}{x^b} =$
x^{a-b}

Quotient to Power
$\left(\frac{x^a}{y^b}\right)^c =$
$\frac{x^{ac}}{y^{bc}}$

Negative Exponent
$x^{-a} = \frac{1}{x^a}$
$\frac{1}{x^{-a}} = x^a$

Zero Exponent
$x^0 =$
1

Rational Exponent
$x^{\frac{n}{m}} =$

Simplify

1. $x^4 * x^5$
x^9

2. $4x^2 * -3x$
$-12x^3$

3. $2x^{-3}y^5$
$\frac{2y^5}{x^3}$

4. $\frac{y^{-5}}{6x^{-3}}$
$\frac{x^3}{6y^5}$

5. $(4x^3y^5)^3$
$64x^9y^{15}$

6. $x^2 * (3xy^2)^0$
x^2

7. x^{-2}
$\frac{1}{x^2}$

8. $\frac{1}{y^{-2}}$
y^2

9. $\frac{x^3y^{-5}x^0}{x^{-4}}$
$\frac{x^7}{y^5}$

10. $\frac{x^5}{x^2}$
x^3

11. $\frac{3z^3}{z^5}$
$\frac{3}{z^2}$

12. $\frac{6x^3y^0}{3x^2z^5}$
$\frac{2x}{z^5}$

Simplify

13. $\left(\frac{x^5}{y^2}\right)^3$

$\frac{x^{15}}{y^6}$

14. $\frac{x^3y^3}{5xy^2}$

$\frac{x^2y}{5}$

15. $\frac{9x^2}{9x^3}$

$\frac{1}{x}$

16. $\frac{10y^3x^0}{5y^2x^3}$

$\frac{2y}{x^3}$

17. $\left(\frac{8z^7}{5x^3}\right)^2$

$\frac{64z^{14}}{25x^6}$

18. $\left(\frac{ab}{4a^4b^5}\right)^3$

$\frac{a^3b^3}{64a^{12}b^{15}}$

$= \frac{1}{64a^9b^{12}}$

19. $\left(\frac{x^2}{y^{-2}}\right)^3$

$\frac{x^6}{y^{-6}}$

$= x^6y^6$

20. 2^0

1

Solve the following exponential equations

20. $3^{a-3} = 3^2$

$a - 3 = 2$

$+3 \quad +3$

$a = 5$

21. $5^{2-2n} = 5^{-3n}$

$2 - 2n = -3n$

$+2n \quad +2n$

$\frac{2}{-1} = \frac{n}{-1}$

$n = -2$

22. $6^x = 1$

$x = 0$

23. $10^x = 10^{15}$

$x = 15$

24. $7^{1-x} = 7^4$

$1 - x = 4$

$-1 \quad -1$

$\frac{-x}{-1} = \frac{3}{-1}$

$x = -3$

25. $9 = 3^x$

$3^2 = 3^x$

$x = 2$

Simplify each expression with addition or subtraction

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

$2x+1$

2. $(2x^2-1x-5)+(x^2+7x-1)$

$3x^2+6x-6$

3. $(-2p-p^2+4p^3)-1(2p^2+7p)$

$-2p-p^2+4p^3-2p^2-7p$

$4p^3-3p^2-9p$

4. $(r^2-6r+2)-1(2r^2+5r-9)$

$r^2-6r+2-2r^2-5r+9$

$-r^2-11r+11$

5. $(2x+7x)+(x+4x^2)-1(15x^2+4x-6)$

$2x+7x+x+4x^2-15x^2-4x+6$

$-11x^2+6x+6$

6. $(3x^4+x-14)+(3y^2+13-5x+8-7x^4)$

$-4x^4-4x+3y^2+7$

Find each product by using the distributive property

11. $x(3x+3)$

$3x^2+3x$

12. $2v(5v^2+v-12)$

$10v^3+2v^2-24v$

13. $6b(-2b+1)$

$-12b^2+6b$

14. $5x(2x^2+x-3)$

$10x^3+5x^2-15x$

15. $(x+3)(x+2)$

	x	3
x	x^2	$3x$
2	$2x$	6

x^2+5x+6

16. $(3r+2)(2r-1)$

	$3r$	2
$2r$	$6r^2$	$4r$
-1	$-3r$	-2

$6r^2+r-2$

Find each product by using the distributive property.

17. $(q-3)(q-7)$

$q^2-10q+21$

	q	-3
q	q^2	$-3q$
-7	$-7q$	21

18. $(9z-1)(4z+8)$

$36z^2+68z-8$

	$9z$	-1
$4z$	$36z^2$	$-4z$
8	$72z$	-8

19. $(x+5)(2x^2-2x+3)$

$2x^3+8x^2-7x+15$

	$2x^2$	$-2x$	3
x	$2x^3$	$-2x^2$	$3x$
5	$10x^2$	$-10x$	15

20. $(x+3)^2=(x+3)(x+3)$

x^2+6x+9

	x	3
x	x^2	$3x$
3	$3x$	9

Simplify each expression by applying the distributive property and combing like terms.

21. $(2x(x+6)+(x+3)$

$2x^2+12x+x+3$

$2x^2+13x+3$

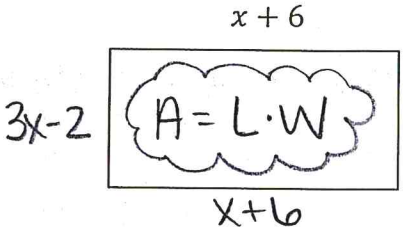
22. $-u(v^2+2v-3)-1(v^2+6)$

$-uv^2-2uv+3u-v^2-6$

Find the area and perimeter of each. Simplify your answer. P = add all sides

23. A= $3x^2+16x-12$

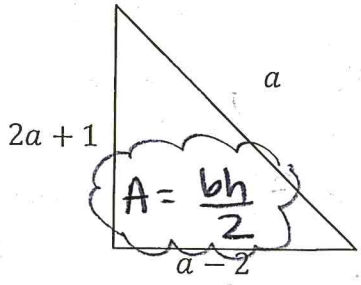
P= $8x+8$



	x	6
$3x$	$3x^2$	$18x$
-2	$-2x$	-12

24. A= $\frac{2a^2-3a-2}{2}$

P= $4a-1$

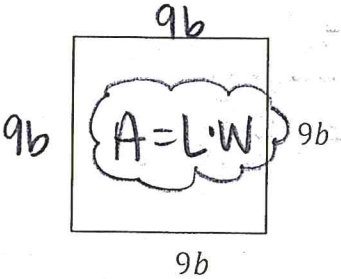


	$2a$	1
a	$2a^2$	a
-2	$-4a$	-2

$\frac{2a^2-3a-2}{2}$

25. A= $81b^2$

P= $36b$



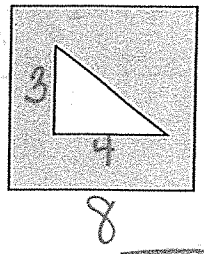
Application problems: Find the area of the shaded region in the simplest form.

$(BIG\ SHAPE) - (LITTLE\ SHAPE) = SHADED\ REGION$

26. A Square has a side length of 8 has a triangle of base 4 and height 3 cut out of it.

$A_\triangle = \frac{bh}{2}$

$A_\square = L \cdot W$



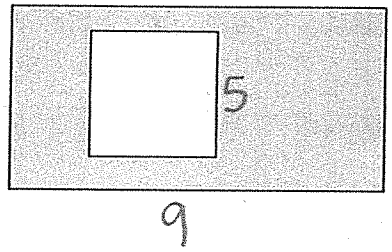
$\square = 8 \cdot 8 = 64$

$\triangle = \frac{4 \cdot 3}{2} = 6$

$64 - 6$ **A = 58**

27. A rectangle with width of 7 and length of 9 has a square of side length 5 cut out of it.

$A_\square = L \cdot W$



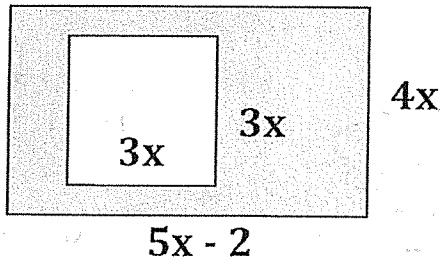
$\square = 9 \cdot 7 = 6$

$\square = 5 \cdot 5 = 25$

$63 - 25$ **A = 38**

What is the area of the shaded region?

28.



$A_\square = L \cdot W$

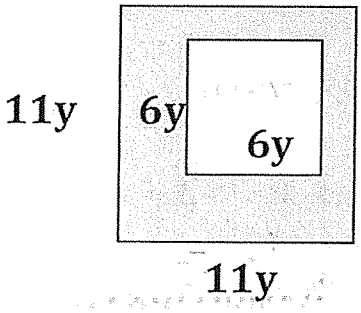
$\square = 4x(5x-2) = 20x^2 - 8x$

$\square = 3x \cdot 3x = 9x^2$

$20x^2 - 8x - 9x^2$

$A = 11x^2 - 8x$

29.



$A_\square = L \cdot W$

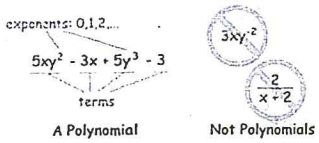
$\square = 11y \cdot 11y = 121y^2$

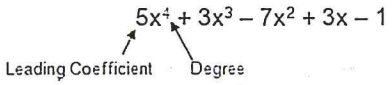
$\square = 6y \cdot 6y = 36y^2$

$121y^2 - 36y^2$

$A = 85y^2$

Identifying Polynomials





Identification by number of terms

2x	Monomial	Monomials consist of 1 term
2x + 3y ↑ ↑ 1 2	Binomial	Binomials consist of 2 terms
$2x^2 + 3x + 5$ ↑ ↑ ↑ 1 2 3	Trinomial	Trinomials consist of 3 terms.
$3x^3 + 2x^2 - 6x + 2$ ↑ ↑ ↑ ↑ 1 2 3 4	Polynomial	If there are more than 3 terms, use the term polynomial.

Identification by degree

5	Constant	A number on it's own is considered a constant monomial.
$2x + 1$	Linear 1st Degree	Highest degree is 1 making this a Linear Binomial. OR 1st Degree Binomial
$3x^2 + 2x + 1$	Quadratic 2nd Degree	Highest degree is 2 making this a Quadratic Trinomial. OR 2nd Degree Trinomial
$x^3 + 3$	Cubic 3rd degree	Highest degree is 3 making this a Cubic Binomial. OR 3rd Degree Binomial
$x^5 + 2x^3 + 3x^2 + 2x$	5th degree	5th Degree 4 Termed Polynomial.

Name each polynomial by degree and number of terms.

30. $3x^2 + 2x$ — Quadratic Binomial

31. 7 — constant

32. $3x + 4$ — Linear Binomial

33. $-5p^3 + 2p^2 - 5$ — Cubic Trinomial

34. $-8n^4 + 5n^3 - 2n^2 - 8n$ — Quartic Polynomial

35. $\frac{5}{x^2+3x}$ — Not a polynomial

36. $9v^7 + 7v^6 + 4v^3 - 1$ — 7th degree polynomial

Identify the GCF of each Polynomial.

31. $6x^2,\ x$ — X

32. $-12x^2y,\ 3xy^2,\ 9x^3y^3$ — 3xy

33. $x^{10},\ x^{11},\ x^{100}$ — x^{10}

34. $xyz,\ x^2y^2z^2,\ x^3y^3$ — xy

35. $abc,\ ab,\ bc,\ cd$ — NO GCF

36. $12x^2,\ 4x, 4$ — 4

Factor out the GCF

37. $32x^2y^8 + 8x^3y^5$

$8x^2y^5$

38. $-8x^3 + 4x^2$

$4x^2$

39. $50x - 45$

5

40. $60m^2n^5 + 12m^2n^6 + 18m^4n^6$

$6m^2n^5$

41. $3x^2 - x$

x

Identify and factor the following special polynomials as Perfect Square Trinomials or Difference of Squares. Look for the GCF first.

42. $16p^2 - 25$

Diff. of Squares

$(4p-5)(4p+5)$

43. $4x^2 + 20x + 25$

Perfect Square

$(2x+5)^2$

44. $4x^2 - 1$

Diff of Squares

$(2x-1)(2x+1)$

45. $16x^2 - 48x + 36$

Perfect Square

GCF = 4 $4(4x^2-12x+9)$

$4(2x-3)^2$

Factor completely. Make sure to look for the GCF first!

46. $x^2 - 12x + 35$

$(x-7)(x-5)$

47. $n^2 + 9n - 10$

$(n+10)(n-1)$

Factor Completely. Make sure to look for the GCF first!

48. $3m^2 + 6m + 3$ GCF = 3

$3(m^2 + 2m + 1)$

$3(m+1)(m+1) = \boxed{3(m+1)^2}$

49. $2p^2 + 18p + 16$ GCF = 2

$2(p^2 + 9p + 8)$

$\boxed{2(p+1)(p+8)}$

50. $2n^2 + 3n - 9$

$ac = -18$

m	s
6 · -3	6 - 3

(-18, 3)

	n	3
2n	$2n^2$	6n
-3	-3n	-9

$\boxed{(2n-3)(n+3)}$

51. $5n^2 + 19n + 12$

$ac = 60$

m	s
4 · 15	4 + 15

(60, 19)

	5n	4
n	$5n^2$	4n
3	15n	12

$\boxed{(5n+4)(n+3)}$

52. $2n^2 + 5n + 2$

$ac = 4$

	n	2
2n	2n	4n
1	n	2

$\boxed{(2n+1)(n+2)}$

53. $3k^2 + 34k + 63$

$ac = 189$

m	s
27 · 7	27 + 7

(189, 34)

	k	9
3k	$3k^2$	27k
7	7k	63

$\boxed{(3k+7)(k+9)}$

54. $4n^2 - 45n + 50$

$ac = 200$

	n	10
4n	$4n^2$	40n
5	5n	50

$\boxed{(4n+5)(n+10)}$

55. $42x^2 + 204x + 144$ GCF = 6

$6(7x^2 + 34x + 24)$

$ac = 168$

m	s
28 · 6	28 + 6

(168, 34)

	x	4
7x	$7x^2$	28x
6	6x	24

$\boxed{6(7x+6)(x+4)}$

Factor Completely by Grouping

56. $20x^3 + 16x^2 - 5x - 4$

	5x	4
$4x^2$	$20x^3$	$16x^2$
-1	-5x	-4

$\boxed{(4x^2-1)(5x+4)}$

57. $10x^3 + 35x^2 - 12x - 42$

	2x	7
$5x^2$	$10x^3$	$35x^2$
-6	-12x	-42

$\boxed{(5x^2-6)(2x+7)}$

Quadratics

Determine the transformation that occurs from the parent function $f(x) = x^2$ to the new function

58. $g(x) = -5x^2 + 1$

Reflection
Compression
Shift up 1 unit

59. $g(x) = (x - 7)^2$

Shift right 7 units

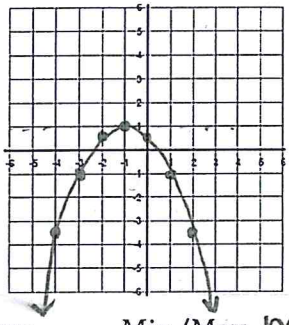
60. $g(x) = -1/3(x + 1)^2 + 8$

Reflection
Stretch
Shift left 1 unit
Shift up 8 units

62. Given the equation, identify the missing information.

$Y = -\frac{1}{2}(x + 1)^2 + 1$

X	Y
-2	.5
-1	1
0	.5
1	-1
2	-3.5



Axis of Symmetry: $x = -1$

Min/Max: max

Vertex: (-1, 1)

Domain: $y \leq 1$

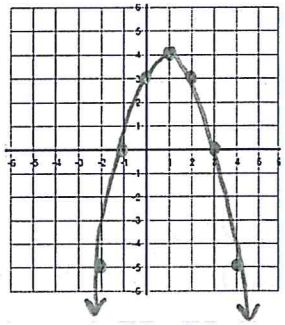
Max/Min Value: max $y = 1$

Range: All real #'s

61. Given the equation, identify the missing information.

$Y = -x^2 + 2x + 3$

X	Y
-2	-5
-1	0
0	3
1	4
2	3



Axis of Symmetry: $x = 1$

Min/Max: max

Vertex: (1, 4)

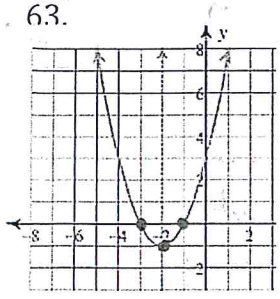
Domain: $y \leq 4$

Max/Min Value: max $y = 4$

Range: All real #'s

Given the graphs below, State how many solutions there are, what the solutions are, the vertex, and the axis of symmetry.

63.



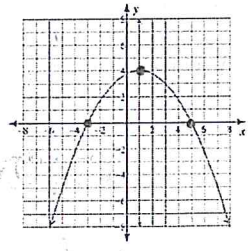
Number of Solutions 2

Solutions: -1 and -3

Vetex: (-2, -1)

AOS: $x = -2$

64.



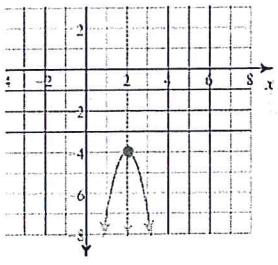
Number of Solutions 2

Solutions: -3 and 5

Vetex: (1, 4)

AOS: $x = 1$

65.



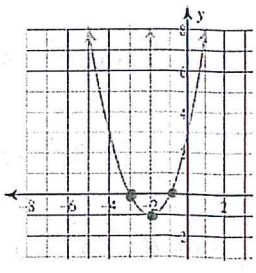
Number of Solutions 0

Solutions: NONE

Vetex: (2, -4)

AOS: $x = 2$

66.



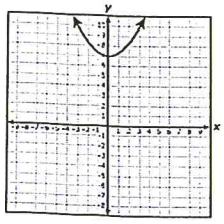
Number of Solutions 2

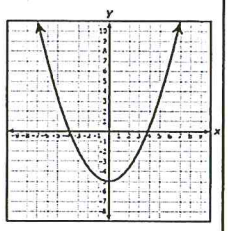
Solutions: -3 and -1

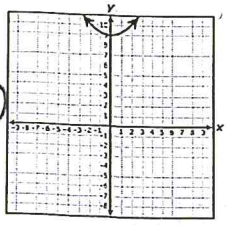
Vetex: (-2, -1)

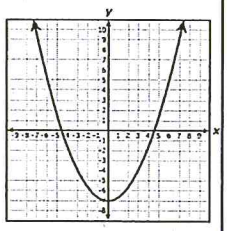
AOS: $x = -2$

67. Which graph can be obtained by translating the graph of $h(x)=0.33x^2+2$ up 7 units?

A 

C 

B 

D 

68. $f(x)=\frac{3}{4}x^2+4$ $h(x)=-\frac{3}{4}x^2+7$

$g(x)=-\frac{2}{3}x^2+5$ $j(x)=\frac{2}{3}x^2+4$

Which 2 equations have same y-int? f(x) and j(x)

Which 2 equations have a maximum? g(x) and h(x)

Which 2 equations DON'T cross the x axis? f(x) and j(x)

69. Which function's graph has a vertex at (3, 5) and contains the point (5, 13)?

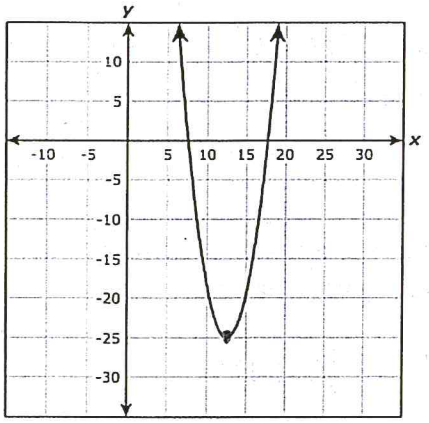
F $y=\frac{1}{10}(x+3)^2-5$

G $y=\frac{1}{10}(x-3)^2-5$

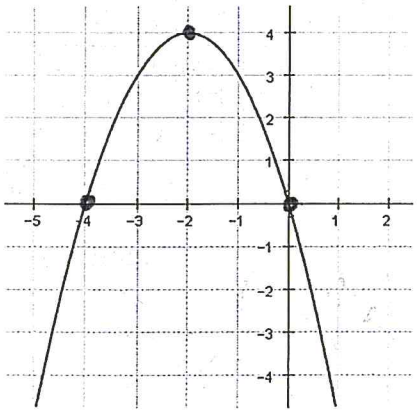
H $y=2(x-3)^2+5$

J $y=2(x+3)^2+$

70. Estimate the vertex of the following parabola. (12.5, -25)



71.



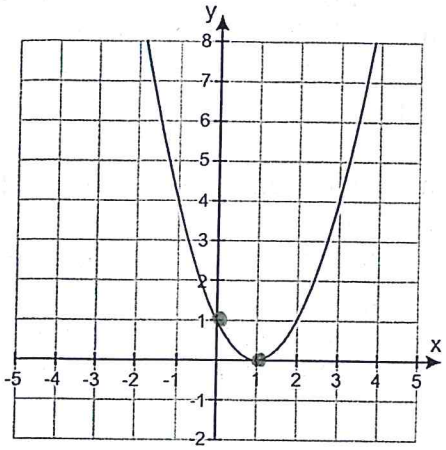
Vertex: (-2, 4) Max/Min: max

Axis of symmetry: x = -2

Zero(s): -4 and 0

Y-intercept: (0, 0)

72.



Vertex: (1,0) Max/Min: Min

Axis of symmetry: x = 1

Zero(s): 1

Y-intercept: (0,1)

73.

X	-8	-9	-10	-11	-12
Y	0	2	4	2	0

Vertex: (-10,4) Max/Min: max

Axis of symmetry: x = -10

Root(s): -8 and -12

Y-intercept: —

74.

x	Y
-4	8
-3	4
-2	1
-1	0
0	1

Vertex: (-1,0)

Max/Min: min

Axis of symmetry: x = -1

Root(s): -1

Y-intercept: (0,1)

75. Use the calculator to find a quadratic function $f(x) = ax^2 + bx + c$ that provides a reasonable fit to the data.

X	0	.5	1	1.5	2	2.5
Y	4	37.5	63	80.5	90	91.5

Equation: _____

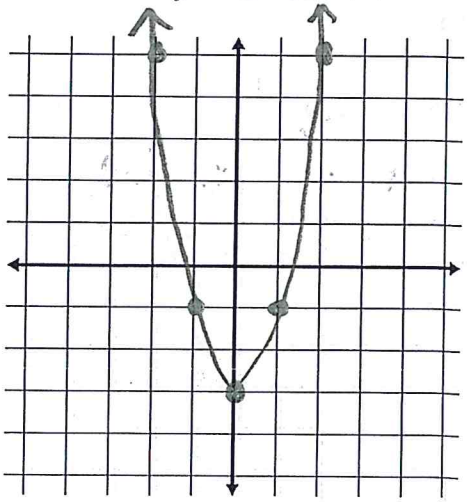
76. Use the calculator to find a quadratic function $f(x) = ax^2 + bx + c$ that provides a reasonable fit to the data.

X	-3	-1	2	5	8
Y	5	0	9	24	81

Equation: _____

77. Graph the following equation, then list the vertex, axis of symmetry, and min/max value. You must have points on your graph.

$y = 2x^2 - 3$

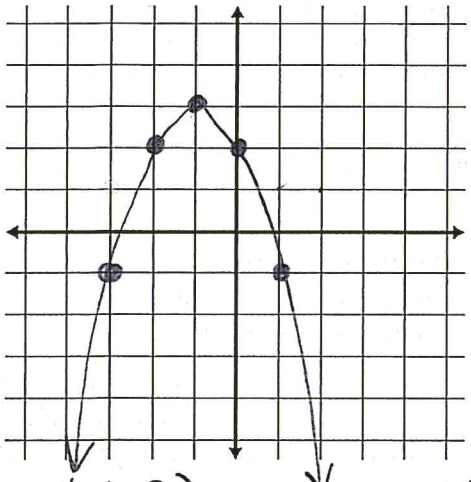


Vertex: (0,-2) Min/Max: min

Axis of Symmetry: x = 0

78. Graph the following equation. You must have points on your graph.

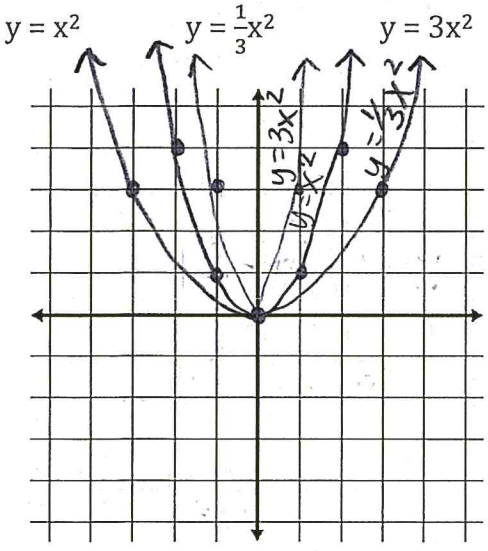
$y = -x^2 - 2x + 2$



Vertex: (-1, 3) Min/Max: max

Axis of Symmetry: $x = -1$

79. Graph the three equations below on the graph provided. Then put the equations in order from the widest graph to the narrowest graph. You must have points on your graph or no credit will be given.



Widest to Narrowest:

$y = \frac{1}{3}x^2$

$y = x^2$

$y = 3x^2$

80. Determine the transformation that occurs from the parent function $f(x) = x^2$ to the new function $g(x) = -3x^2 + 4$

a. Reflection, stretch, shift up 4 units
b. Reflection, compression, shift up 4 units
c. Reflection, shift up 4 units
d. Compression, shift up 4 units.

81. Determine the transformation that occurs from the parent function $f(x) = x^2$ to the new function $g(x) = (x + 8)^2$

e. Shift up 8 units
f. Shift down 8 units
g. Shift left 8 units
h. Shift right 8 units.

82. Given the equation, identify the missing information.

$Y = -2(x + 1)^2 - 4$

Vertex: (-1, -4)

Axis of Symmetry: $x = -1$

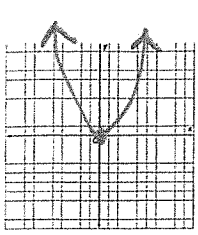
Max/Min value: max $y = -4$

Is this a max/min? max

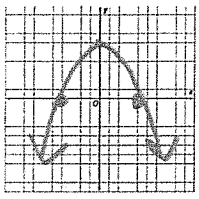
Domain: All real #'s

Range: $y \leq -4$

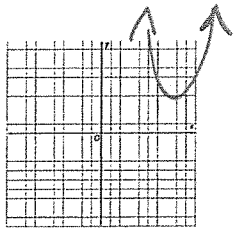
83. Label and sketch the possible solutions for quadratic equations as one solutions, two solutions, or zero real solutions.



one



two



None

Solve the following quadratic equations with the square root.

84. $x^2 - 16 = 0$

$x = \pm 4$

85. $2x^2 - 18 = 0$

$x = \pm 9$

86. $7x^2 = 0$

$x = 0$

Use the Zero-Product Property to solve each equation.

87. $(x + 6)(x - 4) = 0$

$x = -6$

$x = 4$

88. $d(d - 8) = 0$

$d = 0$

$d = 8$

89. $(3f + 2)(2f - 5) = 0$

$f = -\frac{2}{3}$

$f = \frac{5}{2}$

Use Factoring and the Zero-Product Property to solve the following quadratics.

90. $x^2 + 2x - 15 = 0$

$(x+5)(x-3) = 0$

$x = -5$ $x = 3$

91. $x^2 - 15x + 56 = 0$

$(x-7)(x-8) = 0$

$x = 7$ $x = 8$

92. $z^2 - 10z = -24$

$+24 \quad +24$

$z^2 - 10z + 24 = 0$

$(z-6)(z-4) = 0$

$z = 6$ $z = 4$

93. $3b^2 + 7b - 6 = 0$

$ac = -18$

$(3b-2)(b+3) = 0$

	b	3
3b	$3b^2$	9b
-2	-2b	-6

$b = \frac{2}{3}$ $b = -3$

Change the following expressions from exponential to radical form.

94. $x^{\frac{3}{4}}$

95. $3x^{\frac{4}{5}}$

Evaluate the following radicals

96. $\sqrt{81}$

9

97. $\sqrt{36x^2}$

6x

98. $\sqrt{20x^3yz^4}$

4 5 $x \cdot x \cdot x \cdot y \cdot z \cdot z \cdot z \cdot z$

2 2

$2xz^2\sqrt{5xy}$

99. $2\sqrt{80p^4}$

2 40 $p \cdot p \cdot p \cdot p$

2 20

2 10

2 5

$8p^2$

Simplify the following radical expressions using addition or subtraction. You may have to simplify a radical before you can combine.

100. $-11\sqrt{21} + 12\sqrt{21}$

$\sqrt{21}$

101. $-5\sqrt{11} - 10\sqrt{11}$

$-15\sqrt{11}$

102. $2\sqrt{6} + 3\sqrt{54}$

$2\sqrt{6} + 9\sqrt{6}$

9 6

3 3 3 2

$11\sqrt{6}$

103. $-3\sqrt{18} + 3\sqrt{8} - \sqrt{24}$

$-9\sqrt{2} + 6\sqrt{2} - 2\sqrt{6}$

2 9

3 3

2 4

2 2

2 12

2 6

2 3

$-3\sqrt{2} - 2\sqrt{6}$

Simplify the following radical expression using multiplication. Your final answer must be completely simplified.

104. $3\sqrt{12} * \sqrt{6}$

$3\sqrt{72}$

2 36

6 6

$18\sqrt{2}$

105. $-4\sqrt{15} * -\sqrt{3}$

$4\sqrt{45}$

5 9

3 3

$12\sqrt{5}$

Simplify the following radical expression using multiplication. Your final answer must be completely simplified.

106. $\sqrt{20x^2} * \sqrt{20x}$

$\sqrt{400x^3}$

$20x\sqrt{x}$

107. $\sqrt{3v}(\sqrt{6}+2)$

$\sqrt{18v} + 2\sqrt{3v}$

$2 \cdot 9$

$3\sqrt{2v} + 2\sqrt{3v}$

108. $(\sqrt{x}+4)(\sqrt{x}-4)$

	$\sqrt{x}$	4
$\sqrt{x}$	x	$4\sqrt{x}$
-4	$-4\sqrt{x}$	-16

$x-16$

Evaluate each function for $x = -1, 1, 2$.

107. $f(x) = 4 \cdot 7^x$

x	y
-1	.57143
1	28
2	196

108. $y = \frac{2}{3} \cdot 6^x$

x	y
-1	.11111
1	4
2	24

109. A population of 2000 fish increases at an annual rate of 9.3%.

a. Write an expression to represent the equivalent monthly increase in population.

b. How many fish will there be in 5 years?

c. How many fish will there be in 10 years?

Without graphing, tell whether the function represents *exponential growth* or *exponential decay*. Then identify the first term and the amount your function is increasing by.

110. $y = 6.6 \cdot 2^x$

- exponential growth
- increasing by multiplying by 2

111. $g(x) = 7.6\left(\frac{1}{8}\right)^x$

- exponential decay
- decreasing by multiplying by $\frac{1}{8}$

The following topics may also appear on your final exam!

- Solving Equations
- Slope!!!
- Graphing and Writing Linear Equations
  - Slope Intercept
  - Point Slope
- Systems of Equations
  - Substitution
  - Elimination
  - Graphing
- Domain/Range of anything
- Pythagorean Theorem