Math 1 Unit 4 EOC Review

Exponential Function Form

$y = ab^x$ (Growth or Decay)

y = ________

a = initial value

b = growth/decay factor

x = time

When the rate is given as a percent, convert it to a decimal and write as r+1 for growth and r−1 for decay.

Concept questions:

1. Why do we use $1 \pm r$ for the b value when r is given as a percent?
Because the "1" is the starting point so its added if it's growing and subtracted if its decaying

2. Why is the rate of change for an exponential function NOT constant as it is for a linear function?
Because it is based on the time and time does not remain the same

3. Which increases faster – exponential functions or linear functions? Why?
Exponential functions → the value depends on a non-constant value of time

Rewriting Exponents

Exponent Rules: $x^a \cdot x^b = x^{a+b}$ $\quad \frac{x^a}{x^b} = x^{a-b}$ $\quad (x^a)^b = x^{ab}$

$x^{-a} = \frac{1}{x^a}$ $\quad \sqrt{x^a} = x^{\frac{a}{2}}$

Concept Questions:

1. Why does the power rule $(x^a)^b = x^{ab}$ apply for exponents with common bases?

$$(x^2)^3 = x^2 \cdot x^2 \cdot x^2 = (x \cdot x)(x \cdot x)(x \cdot x) = x^6$$

2. Why does taking the square root of an exponent divide the exponent by 2?

$$\sqrt{x^a} = (x^a)^{\frac{1}{2}} = x^{\frac{a}{2}}$$

Geometric Sequences

Geometric Sequence – sequence of numbers that multiplies by the same number to compute the next. term. The number multiplied is called the common ratio.

Explicit Sequence: $a_n = a_1(r)^{n-1}$ Recursive Sequence: $a_n = ra_{n-1}$

n = term # a_1 = 1st term a_n = nth term r = common ratio

a_{n-1} = previous term

Conceptual Questions:

1. Could the function $f(x) = 3(2)^x$ be an arithmetic sequence? What would be a_1 and r?

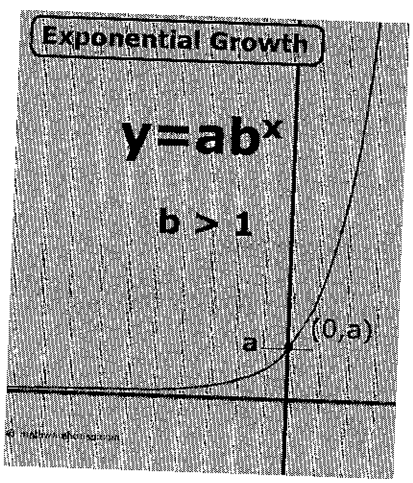
   Yes, it multiplies times a common factor $r=2$ $a_1=3$

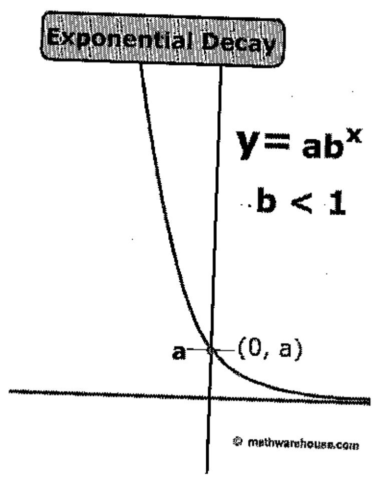
2. Why are geometric sequences and exponential functions taught in the same unit?

   Both are multiplying by a common factor (common ratio or rate of change)

Exponential Graphs

Exponential functions are positive, with the parent function either increasing to infinity or decreasing to the x-axis.





Concept Questions:

1. Why is the *a* value the y-intercept of the parent function for exponential functions?

   when x=0 the b^0 factor=1 so a(1)=a $y=ab^0 \rightarrow y=a(1)$ $y=a$

2. Why does a *b* value between 0 and 1 decrease?

   Function gets smaller as it multiplies by a number between 0 and 1

3. Why does an exponential parent function not have negative values?

   Multiplying a positive times a positive factor always gives a positive answer

Math 1 Unit 4 Practice Problems

	K	J
0	100	100
1	200	300
2	400	500
3	800	700
4	1600	900
5	3200	1100
6	6400	1300
7	12800	1500

$y=2x$ $y=x+200$

13 Katie and Jennifer are playing a game.

- Katie and Jennifer each started with 100 points.
- At the end of each turn, Katie's points doubled.
- At the end of each turn, Jennifer's points increased by 200.

At the start of which turn will Katie first have more points than Jennifer?

End of 3rd → Start of the 4th

17 The table below shows the average weight of a type of plankton after several weeks.

Time (weeks)	Weight (ounces)
8	0.04
9	0.07
10	0.14
11	0.25
12	0.49

$\frac{.49-.04}{12-8} = \frac{.45}{4} = .1125$

What is the average rate of change in weight of the plankton from week 8 to week 12?

A 0.0265 ounce per week

B 0.0375 ounce per week

C 0.055 ounce per week

D 0.1125 ounce per week

20 Monica did an experiment to compare two methods of warming an object. The results are shown in the table below.

Time (Hours)	Method 1 Temperature (°F)	Method 2 Temperature (°F)
0	0	1.5
1	5	3
2	11	6
3	15	12
4	19	24
5	25	48

Which statement ***best*** describes her results?

A The temperature using both methods changed at a constant rate.

B The temperature using both methods changed exponentially.

C The temperature using Method 2 changed at a constant rate.

D The temperature using Method 2 changed exponentially. times 2 each hour

Math 1 Unit 5 EOC Review

Polynomial Operations

Multiplying: Distribute terms times EVERY other term

To distribute exponents, write the polynomial in parentheses and multiply out

Adding or subtracting: combine like terms.

Remember, you can NOT operate with variables in the calculator!

Example 1: $(2x-3)^2$

$(2x-3)(2x-3)$

$4x^2-6x-6x+9$

$4x^2-12x+9$

Concept Questions:

1. What is the difference between $2x+2x$ and $2x(2x)$?

$2x+2x$ $\quad$ $2x(2x)$

$4x$ $\quad$ $4x^2$

2. Write two polynomials that you can NOT multiply using the "FOIL" trick, and explain why not.

$(x+3)(x^2+3x+2)$

There are too many terms

Factoring

GCF

$10x^2-5x$

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

x^2+bx+c

$x^2-9x-22$

$(x^2-11x)(2x-22)$

$x(x-11)\ 2(x-11)$

$\boxed{(x+2)(x-11)}$

ax^2+bx+c

$3x^2-13x-10$

$(3x^2-15x)(2x-10)$

$3x(x-5)\ 2(x-5)$

$\boxed{(3x+2)(x-5)}$

Perfect Squares

x^2-49

$\boxed{(x-7)(x+7)}$

$5x^3+500x$

$5x(x^2+100)$

$\downarrow$

can't factor any further

Concept Questions:

1. Why is a^2-b^2 NOT the same as $(a-b)^2$?

$(a-b)^2=(a-b)(a-b)=a^2-ab-ab+b^2$

$a^2-2ab+b^2$

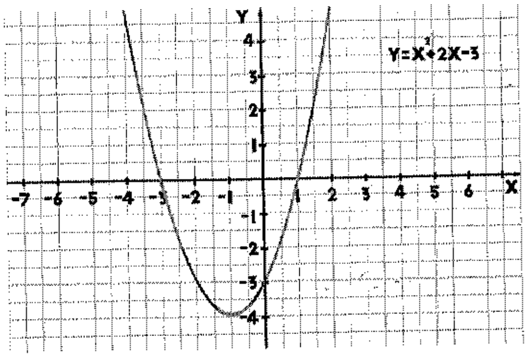
middle terms aren't opposites

2. Why can we NOT just find two numbers that add to b and multiply to c to factor a trinomial with $a>1$?

when the first term (ax) distributes it will not equal the b-value

Quadratic Graphs

The shape of the graph of a quadratic function (with degree, or highest exponent, of 2) is a parabola



$f(x) = ax^2 + bx + c$

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

X-Intercepts	Y-Intercept	Open Up or Down	Vertex	Axis of Symmetry
{-3, 1}	-3	a > 0 - up a < 0 - down	(-1, -4)	x = -1 $x = \frac{-b}{2a}$

Concept Questions:

1. Why is the y-intercept equal to the *c* value?
when x=0 the other terms (ax^2, bx) = zero so y=c

2. Why are the x-intercepts the same as the solutions equal to 0?
Because the equation = zero so y=0

Solving by Factoring

To solve a quadratic by factoring, set the expression equal to 0, factor, and solve factors (set equal to zero)

You will get 2 solutions when solving a quadratic equation.

If both solutions are the same, the solution is a double root, and the vertex is on the x-axis.

Example: $x^2 - 5x = 14$

$x^2 - 5x - 14 = 0$

$(x^2 - 7x)(+2x - 14)$

$x(x-7)\ 2(x-7)$

$(x+2)(x-7)$

$x+2=0 \quad x-7=0$

$\boxed{x=-2} \quad \boxed{x=7}$

Concept Questions:

1. Why is it necessary to set the quadratic equal to 0 before solving?
Because in order to set the factors equal to zero to solve them, the equation must be set equal to zero

Math 1 Unit 5 Practice Problems

3 Which expression is equivalent to $t^2 - 36$?

A $(t - 6)(t - 6)$

B $(t + 6)(t - 6)$

C $(t - 12)(t - 3)$

D $(t - 12)(t + 3)$

$(t+6)(t-6)$

4 Which is the graph of the function $f(x) = 4x^2 - 8x + 7$?

A.O.S. $\frac{-b}{2a} = \frac{8}{2(4)} = \frac{8}{8} = 1$

vertex y

$y = 4(1)^2 - 8(1) + 7$

$4 - 8 + 7$

$y = 3$

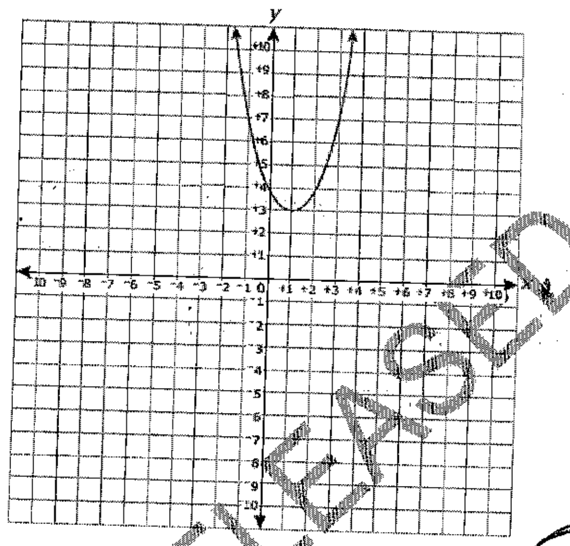
$(1,3)$

y-intercept

$4(0)^2 - 8(0) + 7$

7

A



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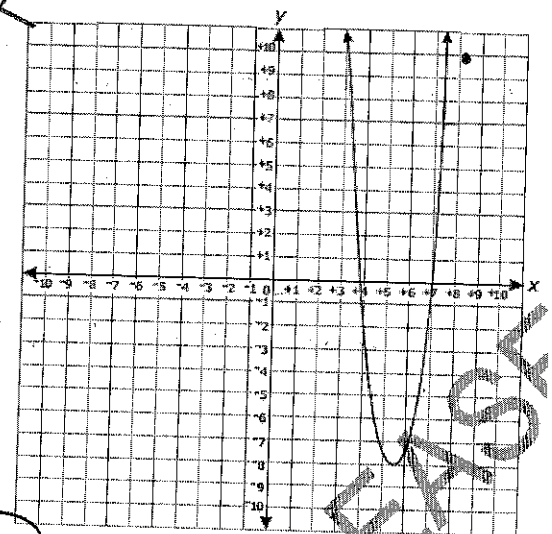

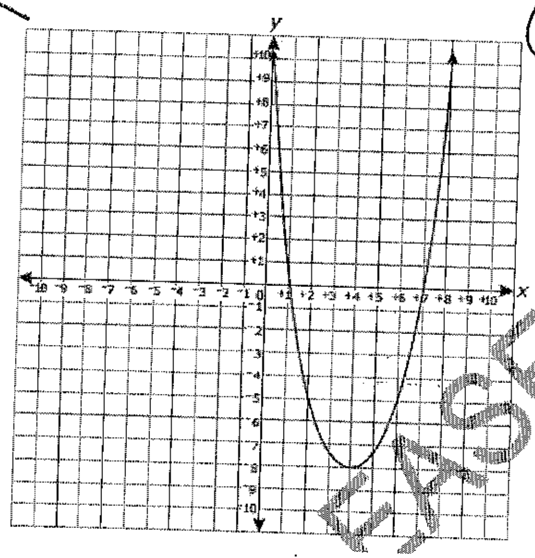

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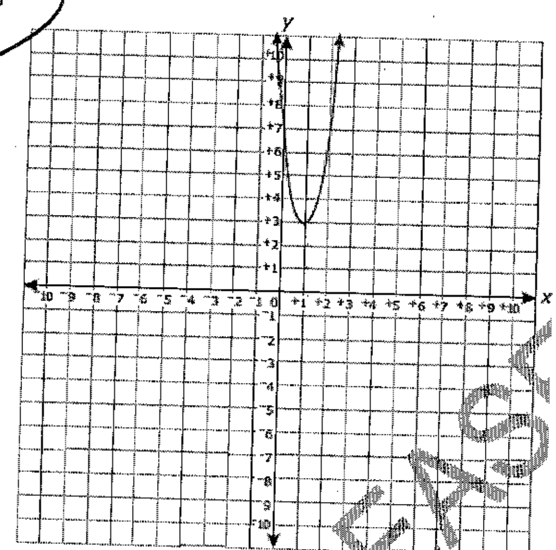


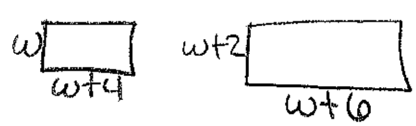
5 The floor of a rectangular cage has a length 4 feet greater than its width, w. James will increase both dimensions of the floor by 2 feet. Which equation represents the new area, N, of the floor of the cage?

A $N = w^2 + 4w$

B $N = w^2 + 6w$

C $N = w^2 + 6w + 8$

D $N = w^2 + 8w + 12$



$(w+2)(w+6)$

$w^2 + 8w + 12$

8 What is the smallest of 3 consecutive positive integers if the product of the smaller two integers is 5 less than 5 times the largest integer?

x
$x+1$
$x+2$

$x(x+1) = 5(x+2) - 5$
$x^2 + x = 5x + 10 - 5$
$x^2 + x = 5x + 5$
$-5x - 5 \quad -5x \quad -5$
$x^2 - 4x - 5 = 0$

$x^2 - 4x - 5$
$(x^2 - 5x)(+x - 5)$
$x(x-5)1(x-5)$
$(x+1)(x-5)$
$x = -1 \quad x = 5$

$\boxed{5}$

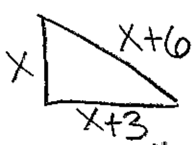
9 The function $f(t) = {}^{-}5t^2 + 20t + 60$ models the approximate height of an object t seconds after it is launched. How many seconds does it take the object to hit the ground? $\rightarrow$ root $\rightarrow$ FACTOR

$-5t^2 + 20t + 60$
$-5(t^2 - 4t - 12)$
$(t^2 - 6t)(+2t - 12)$

$t(t-6)2(t-6)$
$(t+2)(t-6)$
$t = -2 \quad t = 6$

$\boxed{6 \text{ sec}}$

12 The larger leg of a right triangle is 3 cm longer than its smaller leg. The hypotenuse is 6 cm longer than the smaller leg. How many centimeters long is the smaller leg?



$(x)^2 + (x+3)^2 = (x+6)^2$
$x^2 + x^2 + 6x + 9 = x^2 + 12x + 36$
$2x^2 + 6x + 9 = \cancel{x^2} + \cancel{12x} + \cancel{36}$
$-x^2 - 12x - 36 \quad -\cancel{x^2} - \cancel{12x} - \cancel{36}$

$x^2 - 6x - 27 = 0$
$(x^2 - 9x)(+3x - 27)$
$x(x-9)3(x-9)$
$(x+3)(x-9)$
$x = -3 \quad x = 9$

$\boxed{9 \text{ cm}}$

16 Suppose that the equation $V = 20.8x^2 - 458.3x + 3{,}500$ represents the value of a car from 1964 to 2002. What year did the car have the $\boxed{\text{least}}$ value? ($x = 0$ in 1964)

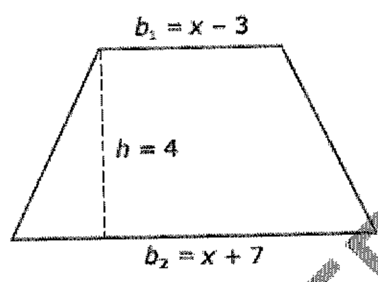
A ~~1965~~ 1 \$3062.50

B ~~1970~~ 6 \$1499.00

C ~~1975~~ 11 \$975.50

D ~~1980~~ 16 \$1492.00

27 The area of a trapezoid is found using the formula $A = \frac{1}{2}h(b_1 + b_2)$, where A is the area, h is the height, and b_1 and b_2 are the lengths of the bases.



$\dfrac{2\cancel{4}(x - 3 + x + 7)}{\cancel{2}}$

$2(2x + 4)$

$4x + 8$

What is the area of the above trapezoid?

A $A = 4x + 2$

B $A = 4x + 8$

C $A = 2x^2 + 4x - 21$

D $A = 2x^2 + 8x - 42$

Math 1 Unit 6 EOC Review

Representations of Data

Very large quantities of data can be seen much easier using a box plot or histogram than a dot Plot.

We can create these using our calculators to easily interpret the data.

Histograms are preferable for showing actual values within the data.

Box plots are preferable for showing the spread of the data.

Concept question:

1. Why are dot plots not preferable for a survey of an entire high school with 2000 students?

2,000 dots would be difficult to count/analyze

Measures of Central Tendency (Mean, Median, IQ Range, SD)

Mean - $\bar{x}$ (average)

Median - MED (Middle value or average of 2 middle values)

Interquartile Range - $Q_3 - Q_1$ the range of the middle 50% of the data

Standard Deviation - Measure of spread of the data

Concept Question:

1. Explain the potential relationship between the IQR and standard deviation for a box plot with very short whiskers and long boxes.

N/A

Outlier Effects

Outlier - Extremely small or large data value

An outlier generally has a larger effect on the mean and stnd. deviation of a data set than the median and IQR.

Concept Question:

1. Why does an outlier not greatly affect a median, but it can have a great effect on a mean?

The middle of a data set may not change based upon an outlier.
The average, or the mean will get pulled in the direction of the outlier

Math 1 Unit 6 Practice Problems

25 The table below shows the area of several states.

State	Area (thousands of square miles)
Connecticut	6
Georgia	59
Maryland	12
Massachusetts	11
New Hampshire	9
New York	54
North Carolina	54
Pennsylvania	46

Delaware has an area of 2,000 square miles. Which is true if Delaware is included in the data set?

A The mean increases.

B The range decreases.

C The interquartile range decreases. 44/46.5

D The standard deviation increases. 22.18/22.86

36 The number of points scored by a basketball player in the first eight games of a season are shown below.

15, 35, 18, 30, 25, 21, 32, 16

What would happen to the data distribution if she scored 24, 22, 27, and 28 points in her next four games?

A The data distribution would become less peaked and more widely spread.

B The data distribution would become less peaked and less widely spread.

C The data distribution would become more peaked and less widely spread.

D The data distribution would become more peaked and more widely spread.

compare the histograms
on the calculator