If you need this document in another format, please email Dede deLaughter, Director of Learning Support dede.delaughter@ung.edu or call 706-310-6207.

Math Necessities

for Review and/or Instruction

for

- Learning Support
- College Algebra
- Mathematical Models
- Quantitative Skills
- SAT/ACT review
- GACE review

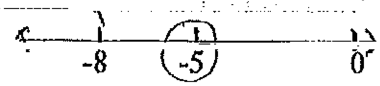
Rules for Operations with Integers Name

[illegible]

B. -2 + -8 = -10

[illegible]

C. -8 + 3 = -5
(Subtract)



To add a positive and a negative, you subtract and take the sign of the larger [illegible] number.

D. Subtraction: To subtract a #, you add its opposite. (Rewrite if needed.)
(After rewriting, use your rules for addition.)

7 – 2	OR	7 – 2	8 – -7
5		7 + -2	8 + +7
		5	15

II. Multiplication and Division

A. 2 x 5 = 10 Positive x Positive = Positive

[illegible]

B. 3 x -2 = -6 Positive x Negative = Negative

Why? 3 x -2 means -2 + -2 + -2 = -6

C. -2 x -5 = 10 Negative x Negative = Positive

(-)(2)(-)(5)
(-)(-)(2)(5)
(+)(10)
(10)

[illegible]

General Guidelines for Solving Equations Name ______________

Goal: To get the variable all by itself on one side of the equation, with only a [illegible]

If needed, clear fractions and decimals

Fractions- by multiplying both sides of the equation by the LCD

Decimals- by multiplying both sides of the equation by a power of [illegible]

[illegible] terms)

Like terms are terms that are exactly alike except for their numerical coefficients - have exactly the same variables with exactly the same exponents

When you add or subtract like terms, the only thing that changes is the numerical coefficient (the number out front)

3. Add or subtract to get all the variables (letters) on one side

4. Add or subtract to get all the constants (numbers [illegible] letters) on the other side

5. Multiply or divide to get the coefficient of the variable to be one [illegible] (multiplication or division)

[illegible] if coefficient is a fraction, multiply by the reciprocal

6. Check

Exponents **Name** ________________

I. When you multiply like bases you add exponents.

[illegible]

II. When you divide like bases you subtract exponents.

$$\frac{20x^7p^3}{35x^5p^8} = \frac{4x^2}{7p^5}$$

III. When you raise a power to a power [illegible]

[illegible]

IV. When combining (adding or subtracting) [illegible]

[illegible]

you can only combine (add or subtract) terms that have exactly the same variables with exactly the same exponents.

$$13a^4c^5 + 5a^4c^2 + 4a^4c^5 = 17a^4c^5 + 5a^4c^2$$

V. Multiplying Polynomials

[illegible]

B. Only for a binomial x a binomial:

1. FOIL may always be used. This is just a method that helps you make sure each term in the first parentheses gets multiplied times each term in the second parentheses. F (First terms in each parentheses), O (Outer most terms), I (Inner most terms), L (Last terms in each parentheses). Then combine like terms.
2. Special product patterns: (Note: FOIL or distributive could always be used on any of these, but the next chapter will be easier if you learn the patterns.)

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

[illegible]

1. $\sqrt{49}$ 2. $\sqrt{98}$ 3. $\sqrt{25}$ 4. $\sqrt{75}$

5. $\sqrt{100}$ 6. $\sqrt{900}$ 7. $\sqrt{700}$ 8. $\sqrt{400}$

9. $\sqrt{4}$ 10. $\sqrt{12}$ 11. $\sqrt{16}$ 12. $\sqrt{32}$ 13. $\sqrt{48}$

14. $\sqrt{9}$ 15. $\sqrt{36}$ 16. $\sqrt{72}$ 17. $\sqrt{27}$ 18. $\sqrt{45}$

19. $\dfrac{3+\sqrt{49}}{2}$ 20. $\dfrac{3-\sqrt{49}}{2}$ 21. $\dfrac{8+\sqrt{36}}{2}$ 22. $\dfrac{8-\sqrt{36}}{2}$

23. $\dfrac{12+\sqrt{16}}{4}$ 24. $\dfrac{12-\sqrt{16}}{4}$ 25. $\dfrac{30 +/- \sqrt{64}}{2}$

Transformations on Parabolas and Absolute Values Name ____________

Parabola | **Absolute Value**

$y = x^2$ | $y = |x|$

$y = x^2$ opens up | $y = -x^2$ opens down | $y = |x|$ opens up | $y = -|x|$ opens down

The number in front of the basic function affects how

2

$y = 3(x-2)^2 + 4$ | $y = |x+5| - 2$

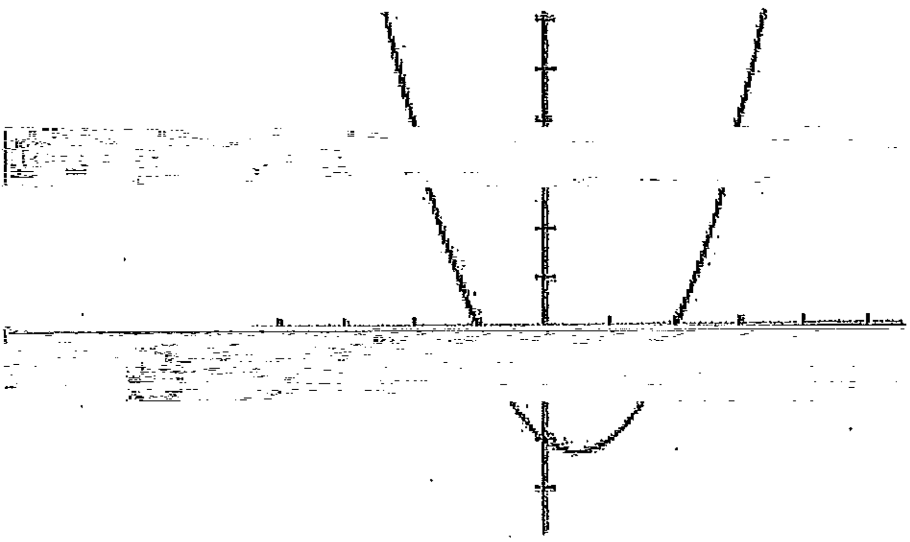
shifts: → 2 ↑4 | shifts: ← 5 ↓2

A #

... inside the basic function, shifts the x in the opposite sign way.

From: $y = a(x-h)^2 + k$ the vertex is (h,k).

2a



This parabola is a graph of the equation:

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

The zeros are where ____ = zero.

How many zeros are on this parabola? ____

What are the zeros (from the graph)?

Two algebraic methods that can be used to find the zeros are:

I. Factoring

II. Quadratic Formula

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

Factoring Methods   Name

Try when you have:	Method
Always look for this first.	1. Factor out GCF
2 terms (both squares)	2. Difference of two squares
$a^2 - b^2$ factors as $(a+b)(a-b)$	$(a+b)(a-b)$
3 terms (2 squares)	3. Perfect square trinomial $a^2 + 2ab + b^2$ $a^2 - 2ab + b^2$ factors as $(a+b)(a+b)$ $(a-b)(a-b)$ $= (a+b)^2$ $= (a-b)^2$
4 terms Try a. when you have 3 perfect squares	4. Factor by grouping a. 1 and 3 or 3 and 1 b. 2 and 2 (involves factoring out GCFs)
2 terms (both cubes)	5. Sum or difference of 2 cubes factors as $(a+b)(a^2 - ab + b^2)$ $(a-b)(a^2 + ab + b^2)$
3 terms	6. Trial and error

Solving Quadratic Equations

Name ______________

We will solve quadratic equations by:

1. Factoring:

Methods of Factoring

of the equation by itself.
Take the square root of both sides.

2. Difference of 2 squares

3. Completing the square:
Given: $x^2 + bx = \#$
Add $(\frac{1}{2}b)^2$ to both sides to obtain a perfect square on the left.
Rewrite the perfect square trinomial as a binomial squared.

Important: Make sure the coefficient of ...

4. Using the quadratic formula:
Get everything on one side = 0. (Important)

Memorize: $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Quadratic Formula Name

Quadratic Equation

a =

b =

c =

2a

Discriminant/
Determining the Nature of the Roots

Name

Quadratic Equation

a= b= c=

$$D = b^2 - 4ac$$

Is D Negative or Zero or Positive?

real solutions

Negative

Zero

one (real) rational solution

Positive

Is D Perfect Square or Not?

solutions solutions

Graphing Lines Name:________________

Main methods for graphing lines:

I. Realizing that the equation of the line may tell us that all of the points on the line may have the same x-coordinate (ex: x = 2) or the same y-coordinate (ex: y = -3).

II. Plotting 2 points on the line and drawing the line:

(Note: I chose #'s for x

that were divisible by

-8 | -4

different points

run

the place where

m = 3/2 up 3/right 2 or down 3/left 2

Substitute 0 in for y, solve for the x-value. Plot the point.

Writing Equations of Lines Name

Horizontal lines Vertical lines

(-3,5) (7,5) (8,-2) (8,3)

all y-coordinates are 5 all x-coordinates are 8

(II) Using y = mx + b (slope-intercept form)

(A) Given m & b: just substitute in

(B) Given two points (-3,4) (7,-10)

The slope and one point start here

-10 = -7/5 (7) + b

(3) Solve for the value of b

-10 = -49/5 + b

-50/5 + 49/5 = b

-1/5 = b

(4) Substitute m & b into formula, leave x & y to stand for all general points on the line

y = -7/5x - 1/5

y-coordinate in that point (i.e.) (0,5) b=5

(III) Using $y - y_1 = m(x - x_1)$ (point-slope form)

(A) Given the slope and one point: just substitute the point in for (x_1, y_1) & the slope in for m, then simplify to get in the desired form.

Ex: (3,-5) m = 7, put the answer in slope-intercept form

y- -5 = 7(x-3)

y + 5 = 7x – 21

y = 7x – 26

(B) Given two points: (7,4) (-8,2)

2/15 x + y = 46/15 ok, but below would look better:

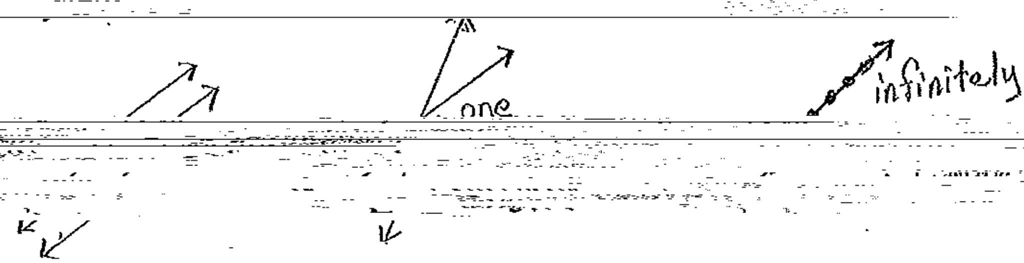
2x – 15y = 46 (multiplied both sides by -15 to get this)

Solving Systems of Equations with 2 Unknowns Name ______________

I. Graphing Method

1. Graph one of the lines. Using $y = mx + b$ may be helpful.

Possible types of solutions:



II. Substitution Method

1. Solve for one of the variables in one of the equations.

4. Substitute that new value (into either equation) to solve for the other variable.
5. Write your ordered pair solution.

III. Addition (Elimination) Method

1. Multiply one or both of the equations by a number to obtain opposite

4. Solve for the remaining variable.

5. Write your ordered pair solution.

Solving Systems with Matrices/ Determinants Name ________________

Solving:

Solve:

$x + 4y - z = 10$
$2x + 5y - 3z = 7$
$8x + y - 2z = 11$

Write the matrix equation:

$$\begin{bmatrix} 1 & 4 & -1 \\ 2 & 5 & -3 \\ 8 & 1 & -2 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 10 \\ 7 \\ 11 \end{bmatrix}$$

The process overall:

$AX = B$
$X = A^{-1}B$

Note: Matrix Mult. is NOT commutative; BA^{-1} will NOT give you the correct answer.

I. Enter matrix A and matrix B into TI-83 plus.

II. Solve by multiplying A^{-1} times B

2nd Mode (Quit)

2nd Matrix 1 x^{-1} ... 2nd Matrix 2 enter

To find inverses:

2nd Mode (Quit)
2nd Matrix 1 x^{-1} enter
To get in fraction form:

III. The answer should be ... So x = 2, y = 3, z = 4

3
4

Determinants:

To find the determinant:

Enter matrix A as above, then:

2nd Mode (Quit)

2nd Matrix ▷ 1

2nd Matrix 1 close parentheses enter

End Behavior (using Highest Degree) Name

	EVEN		ODD	
Highest Degree:	2, 4, 6, 8, ...		1, 3, 5, 7, ...	
and Remember:				
End Behavior (How the graph is pointed at the left and right ends)	If LC is positive: up / up	If LC is negative: down / down	If LC is positive: down / up	If LC is negative: up / down

The end behavior is

The end behavior is

The end behavior is

Understanding Logarithms Name

log means exponent

log = exponent

means: what exponent do you raise 2 to, to get 8?

If no base is written, then the base is understood to be 10.

log 100 "What exponent do you raise 10 to, to get 100?" 2

log 10 "What exponent do you raise 10 to, to get 10?" 1

e = 2.718...

ln means $\log_e$ ln can be read "natural log"

ln e "What exponent do you raise e to, to get e?" 1

The only bases used are log with base 10 and log with base e, so if an

EXPONENT FACTS

A common sense phrase to remember: [illegible]

[illegible]

$1^{[illegible]}$	=	1	$1^{[illegible]}$	=	1	$(-1)^{[illegible]}$	=	-1	$-1^{[illegible]}$	=	-1
[illegible]											
3^2	=	9	3^3	=	27	$(-3)^3$	=	-27	-3^3	=	-27
4^2	=	16	4^3	=	64	$(-4)^3$	=	-64	-4^3	=	-64
5^2	=	25	5^3	=	125	$(-5)^3$	=	-125	-5^3	=	-125
6^2	=	36	6^3	=	216	$(-6)^3$	=	-216	-6^3	=	-216
[illegible]											
[illegible]	=	[illegible]									
9^2	=	81									
10^2	=	100				$(-1)^2$	=	1	-1^2	=	-1
11^2	=	121				$(-2)^2$	=	4	-2^2	=	-4
12^2	=	144				$(-3)^2$	=	9	-3^2	=	-9
13^2	=	169				$(-4)^2$	=	16	-4^2	=	-16
14^2	=	196				$(-5)^2$	=	25	-5^2	=	-25
15^2	=	225				$(-6)^2$	=	36	-6^2	=	-36
[illegible]	=	[illegible]				[illegible]	=	[illegible]	[illegible]	=	[illegible]
17^2	=	289									
18^2	=	324				1^4	=	1	1^5	=	1
19^2	=	361				2^4	=	16	2^5	=	32
20^2	=	400				3^4	=	81	3^5	=	243
25^2	=	625				10^4	=	10000	10^5	=	100000