Mathematics 135-002
Career Algebra
Fall, 2015

Instructor: Cathy Frost **E-mail:** frost@camosun.bc.ca
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Timetable:

Time	Monday	Tuesday	Wed	Thursday	Friday
11:00am-12:50pm			Math 135-002 CC121 (IU)		Math 135-002 CC121 (IU)
1:00-1:50pm			Office Hour		Office Hour
2:00-2:50pm		Office Hour			
3:00-4:50pm	Math 137-002 E346	Math 137-002 E346	Math 137-002 E346	Math 137-002 E346	
5:00-5:50pm	Office Hour		Office Hour		
6:00-7:50pm	Math 135-003 E346		Math 135-003 E346		
Additional Office Hours by Appointment					

Important Dates:

Sep 8	First day of classes
Sep 22	Fee Deadline
Oct 12	Holiday
Nov 9	Withdrawal Deadline
Nov 11	Holiday
Dec 11	Last day of classes for Fall term
Dec 14-19, 21,22	Final Exam Period

2. Intended Learning Outcomes

(3 credits) This course may be used for entry into business programs, the criminal justice program, elementary education, and elementary statistics. It is also a good choice for students who want to refresh their skills before tackling a higher level mathematics course. Topics include a brief review of fractions, decimals, percentages and signed numbers; solving linear equations and inequalities in one variable; graphing linear equations and inequalities in two variables; function notation; systems of linear equations; integer and rational exponents; and fundamental polynomial operations. Source: Camosun College calendar http://camosun.ca/learn/calendar/current/web/math.html

3. Exit Grade

A grade of C+ (65%) or better is needed for Business Programs at Interurban, Math 112, 113 or 109.
A grade of C or better is needed for Math 116 or 137. Note that Math 135 cannot be used by BBA students to satisfy the UT math requirement although it can satisfy pre-requisites.

4. Required Materials

a) Career Algebra , Tobey, Slater, Blair, Crawford, 1st Custom Edition, Pearson, 2013.

b) The only calculators allowed on tests and the final exam are the Sharp EL-531 scientific calculator or the Texas Instrument BA II Plus. Calculators will not be allowed on the first test.

5. Recommended Materials or Services to Assist Students to Succeed Throughout the Course

Math Labs:) Tec142 (INT)and Ewing 342 & 224 (LANS)**:** These drop-in centres are available for you to work on math homework and to seek free help from the tutor on staff. See the hours posted on the math lab doors or go to http://camosun.ca/learn/programs/math/labs.html .

Study Tips: It is recommended that approximately 3-6 hours per week be spent studying for this course outside of class time. Find a study buddy to discuss math problems and use the math labs.

Academic Progress: The College has an academic progress policy geared mainly toward "at risk" students, the stated intention for which is to improve a student's likelihood of success. To view the policy, see the webpage http://camosun.ca/about/policies/education-academic/e-1-programming-&-instruction/e-1.1.pdf

6. Basis of Student Assessment and Grading

Assignments: There are 4 assignments. A handout will be provided at least a week before the due date. Full solutions are required. Assignments are due **by 1:30pm** on the designated day (see pacing schedule) and can be handed in in class or in my office. Assignment keys will be posted on the website. Late assignments will NOT be accepted. There are no dropped assignments.

Tests: There are 4 tests. The dates and topics are on the pacing schedule. No calculators are allowed for Test 1. If you miss a test for any reason a zero will be assigned unless you make alternate arrangements with your instructor before the test. There are no dropped tests.

Grade Calculation: The final grade will be calculated according to the following breakdown:

Assignments	20%
Tests:	30%
Comprehensive Final Exam (with no calculator section)	50%

Grade Scale:

0-49	50-59	60-64	65-69	70-72	73-76	77-79	80-84	85-89	90-100
F	**D**	**C**	**C+**	**B–**	**B**	**B+**	**A–**	**A**	**A+**

For information on Camosun College's grading policy, see the webpage http://camosun.ca/about/policies/education-academic/e-1-programming-&-instruction/e-1.5.pdf

Academic Integrity: The Department of Mathematics and Statistics has prepared a handout called *Student Guidelines for Academic Integrity* to help you interpret college policies involving student conduct, academic dishonesty, plagiarism, etc. It is your responsibility to become familiar with the contents of the document and the college policies it references.

7. Course Content, Recommended Homework, and Schedule

Section		Recommended Homework (Answers in back of text)
	Review Chapter of Arithmetic Skills	
R.1	Simplify Fractions	11,17,19,33,41,45,47,57
R.2	Add And Subtract Fractions	3,15,19,25,37,43,53,55,73,75
R.3	Multiply And Divide Fractions	3,13,15,17,19,21,27,35,37,51,57
R.4	Decimals	5,17,23,31,35,45,51,53,75
R.5	Percent , Rounding & Estimating	5,9,15,17,27,33,35,41,43,51,61
R.6	Problem Solving	1,3,5,13,15
Test 1		
	Chapter 1 Real Numbers and Variables	
1.1	Adding Real Numbers	1,3,7,11,21,25,29,41,67,73
1.2	Subtracting Real Numbers	3,15,19,23,45,57,63
1.3	Multiply & Divide Real Numbers	3,15,19,27,35,39,47
1.4	Exponents	5,13,15,23,25,29,39,43
1.5	Order Of Operations	5,9,11,15,21,25,29
1.6	Distributive Property	7,9,15,17,21,23,25,31,41
1.7	Combining Like Terms	5,11,23,27,33,35,43
1.8	Substitution	7,13,17,25,33,39,43,47,55
1.9	Grouping	1,7,9,11,13,17,25
	Chapter 2 Equations and Inequalities	
2.1	Addition Principle	15,21,27,29,39,43
2.2	Multiplication Principle	3,5,9,17,31,39,45,49
2.3	Addition &Multiplication Principle Together	3,7,11,17,23,27,29,37,41,47
2.4	Equations With Fractions	1,3,9,11,15,17,21,25,31,33,41,43,45
2.5	Formulas	3,5,7,9,11,13,15,23,25,31,33,39,43
2.6	Inequalities and Compound Inequalities*	7,23,25,27,33,35,37,47,51,53,57,59, Handout
Test 2		
	Chapter 3 Solving Applied Problems	
3.1	Translating English To Algebraic Expressions	3,9,17,21,25,27,29
3.2	Word Problems	5,9,11,15,19,25,31
3.3	Word Problems Comparisons	1,5,9,11,15
3.4	Word Problems: Money & %	1,3,7,9,11,13,15,19,25
3.5	Word Problems: Geometry	7,9,13,15,23,29
3.6	Word Problems: Inequalities	3,5,7,15,17,21,23
	Chapter 4 Exponents and Variables	
4.1	Rules Of Exponents	5,7,11,17,19,23,25,31,39,41,49,53,61,65,69,73,77,81,83
4.2	Negative Exponents & Scientific Notation	1,3,5,7,9,11,13,15,17,19,25,29,35,37,39,43,47,49,61
	Rational Exponents*	Handout
4.3	Fundamental Polynomial Operations	5,7,11,13,19,21,27,31,33
4.4	Multiply Polynomials	1,3,5,7,9,25,29,33,37,41,45,49,51
4.5	Multiply Polynomials: Special Cases	3,5,9,13,17,23,31,37,41,43
4.6	Dividing Polynomials	1,5,9,11,17,19,23
Test 3		
	Chapter 5 Graphing & Functions	
5.1	Rectangular Coordinate System	5,9,19,21,23,25,29,35,39
5.2	Graphing Linear Equations	1,3,5,13,15,17,21,23,25,27,29,33
5.3	Slope	1,3,9,11,17,19,25,29,33,37,41,47,51,55
5.4	Write the Equation of a Line	1,3,9,11,21,23,27,31,33,37
5.5	Graph Inequalities	3,5,9,13,15,17
5.6	Functions	5,7,11,15,19,23,29,31,33,35,39,41
	Chapter 6 Systems of Equations	
6.1	Solving Equations With Two Variables; Graphing	1,3,7,11,19,21,25
6.2	Solving Equations With Two Variables: Substitution	1,5,9,11,29,35
6.3	Solving Equations With Two Variables: Elimination	5,13,15,27,33,39
6.4	Review of Methods	5,11,17,21,27
6.5	Word Problems	1,5,13,15,17,21
Test 4		

* Topic is not in the text but is covered in class and by a handout

Pacing Schedule (tentative)

Wk		Wednesday	Friday
1	Sept 7-11	Intro, R.1,R.2	R.3,R.4,R.5,R.6
2	Sept 14-18	R.3,R.4,R.5,R.6	1.1-1.3 *Assignment #1 due*
3	Sept 21-25	1.4,1.5 *Fee deadline (on Sept 22)*	**Test** #1 (R,1-R.6 no calculators) 1.6
4	Sept 28-Oct 2	1.7,1.8,1.9	2.1, 2.2,2.3
5	Oct 5-9	2.4, 2.5	2.6 , Compound Inequalities (handout)
6	Oct 12-16	3.1,3.2-3.6	3.2-3.6 *Assignment #2 due*
7	Oct 19-23	4.1, 4.2	**Test #2** (1.1-1.9,2.1-2.6)
8	Oct 26-30	Rational Exponents (handout), 4.3	4.4,4.5
9	Nov 2-6	4.6	5.1,5.2 *Assignment #3 due*
10	Nov 9-13 Withdrawal deadline Nov 9	Holiday	5.3, 5.4
11	Nov 16-20	**Test #3** (3.1-3.6, 4.1-4.6)	5.5, 5.6
12	Nov 23-27	6.1,6.2	6.3
13	Nov 30-Dec 4	*6.4*	6.5 *Assignment #4 due*
14	Dec 7-11	**Test #4** (5.1-5.6, 6.1-6.5)	Exam Review
Final Exam Period: Dec 14-19,21,22			

2.6 Handout on Compound Inequalities

A compound inequality is the combination of two or more sets. When combining sets with a short list of objects, we use roster notation. For a combination of sets with inequalities, we use set-builder or interval notation.

I Unions of Sets

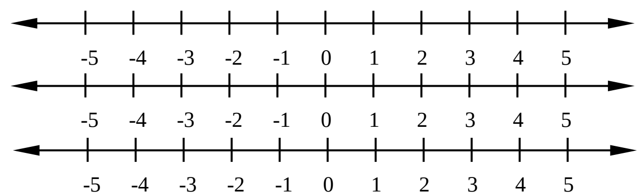
The union of two sets A and B contains the elements that are in at least one set. For example, I am thinking of a number that is less than 2 or greater than 5, what are the possible solutions? We write it as $A \cup B$. **We use the symbol $\cup$ or the word '*or*' to describe a union.**

Eg. 1. Find $\{3,5,8,10\} \cup \{-2,0,3,10,14\}$

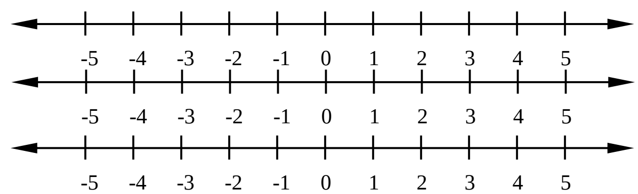
.Eg. 2 Solve and Graph

Steps for solving and graphing a compound inequality:
1. Solve each equation for x
2. Draw each inequality on its own number line
3. Include all numbers on the final graph. Write the solution efficiently.

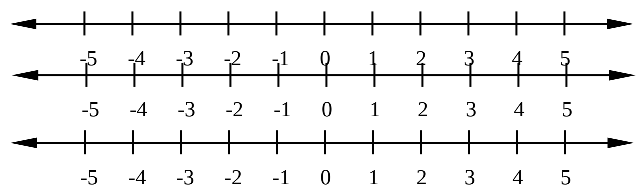
a) $x > -2$ *or* $x \le 4$



b) $-x \ge 1$ *or* $x > 3$



c) $2x - 4 > 8$ *or* $5 \le -x + 3$



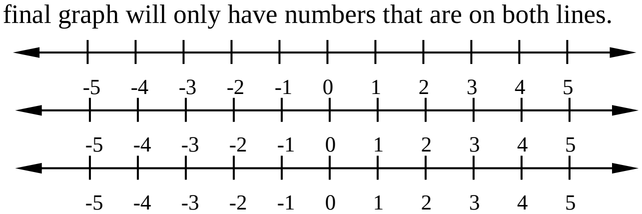
II Intersections of Sets

The intersection of two sets, A and B, is the set of all elements that are in **both** set A and set B. For example, I am thinking of a number that is less than 5 and greater than 2, what are the possible solutions? We write this as $A \cap B$. **We use the symbol $\cap$ or the word '*and*' to describe an intersection.**

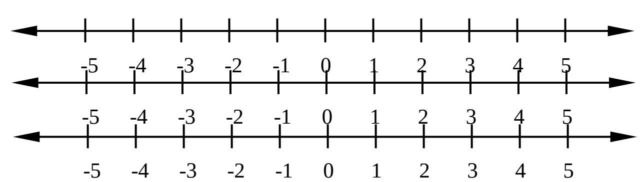
1. Find $\{3,5,8,10\} \cap \{-2,0,3,10,14\}$

2. Solve and graph . Same steps as before except the final graph will only have numbers that are on both lines.

a) $-3x < -6$ *and* $2(x+1) \ge 0$



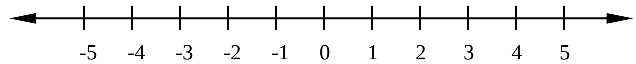
b) $\frac{1}{2}x - 1 > \frac{1}{3}$ *and* $\frac{-x+5}{2} > 3$



Sometimes two sets have no elements in common. This is called the ________________________________

III Sandwiches

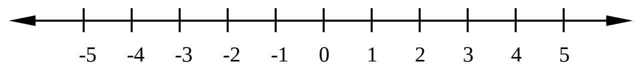
$-2 < x \le 3$ means



If we add the same quantity to all three sections do we change the solution?

$-2+1 < x+1 \le 3+1$

Solve and graph $5 < 9 - 2x \le 7$



IV Application

Brian uses a wetsuit for temperatures between 58° and 68° Fahrenheit. What is the range for the corresponding Celsius temperatures? The equation $F = 1.8C + 32$ can be used to convert Celsius temperatures C to Fahrenheit temperatures F.

Exercises

1. Find

a) $\{2,5,12,19,23\} \cup \{6,10,12,19\}$

b) $\{-7,0,3,8\} \cap \{-4,0,2,8,14\}$

2. Solve and graph on a number line. Draw the final most efficient way of representing the solution.

a) $x < -3 \;\; or \;\; x \ge 1$

b) $x \le -2 \;\; or \;\; x < 4$

c) $3x + 7 > 19 \;\; and \;\; 7 - 2x \le 11$

d) $3(x-1) > 4(x-2) \;\; or \;\; \dfrac{x+4}{3} \ge 2$

e) $-4 > x$ and $-3x \le 6$

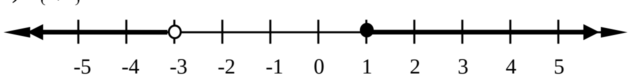
f) $-9 \le 2x - 5 \le 5$

3. For an aerobic workout, a 20 year old woman wants to keep her heart rate between 150 and 170 beats per minute. If she checks her pulse for a 10 second interval, how many beats should it fall between? Express as an inequality.

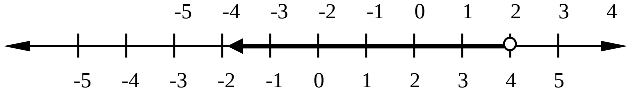
Answers

1a) $\{2,5,6,10,12,19,23\}$ b) $\{0,8\}$

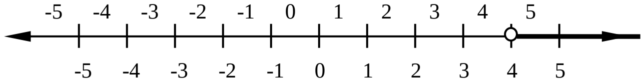
2 a) $x \le -2 \;\; or \;\; x < 4$



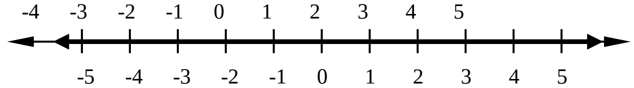
b) $x < 4$



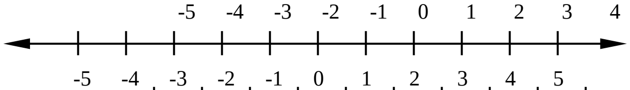
c) $x > 4$



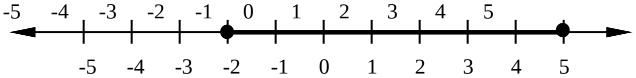
d) All real numbers



e) { }



f) $-2 \le x \le 5$



Rational (Fractional) Exponents Handout

Section 1 – Understanding and defining $a^{1/2}$

When we assign meaning to the expression, $a^{1/2}$, our guiding principle will be to make sure that our interpretation is consistent with the known rules of exponents. For example: $9^2 \cdot 9^3 = (9 \cdot 9) \cdot (9 \cdot 9 \cdot 9) = 9^5$ This is the sum rule for exponents, that is: $9^2 \cdot 9^3 = 9^{2+3} = 9^5$ If we want to give meaning to $9^{1/2}$,then by the sum rule for exponents we have $9^{1/2} \cdot 9^{1/2} = 9^{1/2+1/2} = 9^1 = 9$ Therefore, $9^{1/2}$ is the number that if you multiply it by itself gives 9. So it makes sense to define $9^{1/2} = 3$ since $3 \cdot 3 = 9$. We already know that $\sqrt{9} = 3$, so it also makes sense that: $9^{1/2} = \sqrt{9}$. We know that the square root of a negative number is not a real number (no number multiplied by itself can give a negative answer), so $a^{1/2}$ will not be a real number if a is negative. Therefore for all positive real numbers a, we have: $a^{1/2} = \sqrt{a}$

Examples: Evaluate the following if possible: a) $49^{1/2}$ b) $(-25)^{1/2}$

a) $49^{1/2}$ is the number that if you multiply it by itself gives 49 .Since $7 \cdot 7 = 49$, we have $49^{1/2} = 7$ **or** $49^{1/2} = \sqrt{49} = 7$

b) There is no real number that you can multiply by itself to give -25, so $(-25)^{1/2}$ is not a real number.

Exercises: Evaluate the following if possible.

1. $36^{1/2}$ 2. $100^{1/2}$ 3. $\left(\frac{1}{16}\right)^{1/2}$ 4. $(-9)^{1/2}$ 5. $\left(\frac{64}{25}\right)^{1/2}$

Section 2 – Understanding and defining $a^{1/3}$

Using the same reasoning that we applied in Section 1, we have: $8^{1/3} \cdot 8^{1/3} \cdot 8^{1/3} = 8^{1/3+1/3+1/3} = 8^1 = 8$. That is, $8^{1/3}$ is the number that you multiply 3 times to give 8. We know that: $2 \cdot 2 \cdot 2 = 8$. Therefore $8^{1/3} = 2$ We also know that the cube root of 8 is 2, that is $\sqrt[3]{8} = 2$, so $8^{1/3} = \sqrt[3]{8}$. Unlike square roots, it is possible to take the cube root of a negative number, so $\sqrt[3]{-64} = -4$ since $(-4) \cdot (-4) \cdot (-4) = -64$. So, $(-64)^{1/3} = -4$. Therefore for all real numbers a, we have: $a^{1/3} = \sqrt[3]{a}$

Examples: Evaluate the following if possible: a) $125^{1/3}$ b) $(-216)^{1/3}$

a) $125^{1/3}$ is the number you multiply 3 times to give 125. Since $5 \cdot 5 \cdot 5 = 125$, we have $125^{1/3} = 5$ **or** $125^{1/3} = \sqrt[3]{125} = 5$

b) $(-216)^{1/3}$ is the number you multiply 3 times to give -216. Since $(-6)(-6)(-6) = -216$, we have $(-216)^{1/3} = -6$ **or** $(-216)^{1/3} = \sqrt[3]{(-216)} = -6$

Exercises: Evaluate the following if possible:

6. $27^{1/3}$ 7. $(1000)^{1/3}$ 8. $(-8)^{1/3}$ 9. $\left(\frac{1}{64}\right)^{1/3}$ 10. $\left(\frac{8}{27}\right)^{1/3}$

Section 3 – Understanding and defining $a^{1/n}$

Taking the same approach as above, it seems obvious that $625^{1/4}$ should be the number that when multiplied four times gives 625. Since $5 \cdot 5 \cdot 5 \cdot 5 = 625$ we must have: $625^{1/4} = \sqrt[4]{625} = 5$. In general, for a real number a we define: $a^{1/n} = \sqrt[n]{a}$ The only exception to this is when a is negative and n is even. In this case $a^{1/n}$ is undefined (not a real number). For example: $(-16)^{1/4} = \sqrt[4]{-16}$ is undefined, since there is no real number that multiplies itself 4 times to give an answer of -16. However, if n is odd we get $(-32)^{1/5} = \sqrt[5]{(-32)} = -2$, since -2 multiplied by itself 5 times gives -32.

Examples: Evaluate the following if possible: a) $64^{1/6}$ b) $(-243)^{1/5}$ c) $(-48)^{1/4}$

a) $64^{1/6}$ is the number that when multiplied by itself six times gives 64. So $64^{1/6} = \sqrt[6]{64} = 2$

b) $(-243)^{1/5}$ is the number that when multiplied by itself 5 times gives -243. So $(-243)^{1/5} = \sqrt[5]{-243} = -3$

c) There is no real number that when multiplied by itself four times would give a negative answer. So, $(-48)^{1/4}$ is not a real number.

Exercises: Evaluate the following if possible:

11. $81^{1/4}$ 12. $32^{1/5}$ 13. $(-10000000)^{1/7}$ 14. $\left(\frac{625}{16}\right)^{1/4}$ 15. $(-256)^{1/8}$

Section 4 – Understanding and defining $a^{m/n}$

Now that we know how to evaluate $a^{1/n}$ we will continue to use rules of exponents to determine how to interpret $a^{m/n}$. Remember the power rule of exponents that gives: $(9^2)^4 = 9^{2\cdot 4} = 9^8$ If we want to calculate $9^{3/2}$ this same rule of exponents would give:

$(9^{1/2})^3 = 9^{1/2\cdot 3} = 9^{3/2}$ or $(9^3)^{1/2} = 9^{3\cdot 1/2} = 9^{3/2}$ .So, we have two ways to evaluate $9^{3/2}$, either:

$9^{3/2} = (9^{1/2})^3 = (\sqrt{9})^3 = (3)^3 = 27$ or $9^{3/2} = (9^3)^{1/2} = (729)^{1/2} = \sqrt{729} = 27$

Note that although both interpretations are valid, the first is often simpler when working numerical answers without a calculator. So in general for a real number a we have: $a^{m/n} = (a^{1/n})^m = (\sqrt[n]{a})^m$ or $a^{m/n} = (a^m)^{1/n} = \sqrt[n]{a^m}$

As before if a is negative and n is even $a^{m/n}$ will not be a real number.

Examples: Evaluate the following if possible: a) $16^{3/4}$ b) $125^{4/3}$ c) $(-49)^{5/2}$

a) $16^{3/4} = (\sqrt[4]{16})^3 = 2^3 = 8$ b) $125^{4/3} = (\sqrt[3]{125})^4 = 5^4 = 625$

c) $(-49)^{5/2}$ is not a real number

Exercises: Evaluate the following if possible, use your calculator for Question 21.

16. $8^{5/3}$ 17. $81^{5/4}$ 18. $(-100000)^{2/5}$ 19. $\left(\frac{16}{9}\right)^{3/2}$ 20. $(-25)^{5/6}$ 21. $(-9)^{5/3}$

Section 5 – Negative Rational Exponents $a^{-m/n}$

Lastly, we want to recall how to interpret negative exponents. In keeping with the rules of exponents, we have

$9^{-2}\cdot 9^2 = 9^{-2+2} = 9^0 = 1$ therefore $9^{-2} = \frac{1}{9^2} = \frac{1}{81}$

This holds true for rational exponents as well, so we would have: $27^{-5/3} = \frac{1}{27^{5/3}} = \frac{1}{(\sqrt[3]{27})^5} = \frac{1}{3^5} = \frac{1}{243}$

Exercises: Evaluate the following if possible:

22. $36^{-3/2}$ 23. $64^{-2/3}$ 24. $(-8)^{-4/3}$ 25. $(-4)^{-7/4}$ 26. $\left(\frac{16}{81}\right)^{-3/4}$

Answers:

1. 6 2. 10 3. $\frac{1}{2}$ 4. not real 5. $\frac{8}{5}$ 6. 3

7. 10 8. -2 9. $\frac{1}{4}$ 10. $\frac{2}{3}$ 11. 3 12. 2

13. -10 14. $\frac{5}{2}$ 15. not real 16. 32 17. 243 18. 100

19. $\frac{64}{27}$ 20. not real 21. -38.94 22. $\frac{1}{216}$ 23. $\frac{1}{16}$ 24. $\frac{1}{16}$

25. not real 26. $\frac{27}{8}$