

UC 12306 135

CBM003 ADD/CHANGE FORM

APPROVED APR 24 2013

Undergraduate Council
 New Course Course Change
 Core Category: Math Effective Fall ~~2013~~ **2014**

or

Graduate/Professional Studies Council
 New Course Course Change
 Effective Fall 2013

1. Department: Mathematics College: NSM
 2. Faculty Contact Person: Charles Peters Telephone: 743-3516 Email: charles@math.uh.edu

3. Course Information on New/Revised course:

- Instructional Area / Course Number / Long Course Title:
MATH / 1310 / College Algebra
- Instructional Area / Course Number / Short Course Title (30 characters max.)
MATH / 1310 / COLLEGE ALGEBRA
- SCH: 3.00 Level: FR CIP Code: 27.0101.00.01 Lect Hrs: 3 Lab Hrs: 0

RECEIVED APR - 4 2013

4. Justification for adding/changing course: To meet core curriculum requirements

5. Was the proposed/revised course previously offered as a special topics course? Yes No

If Yes, please complete:

- Instructional Area / Course Number / Long Course Title:
 / /
- Course ID: Effective Date (currently active row):

6. Authorized Degree Program(s):

- Does this course affect major/minor requirements in the College/Department? Yes No
- Does this course affect major/minor requirements in other Colleges/Departments? Yes No
- Can the course be repeated for credit? Yes No (if yes, include in course description)

7. Grade Option: Letter (A, B, C ...) Instruction Type: lecture ONLY (Note: Lect/Lab info. must match item 3, above.)

8. If this form involves a change to an existing course, please obtain the following information from the course inventory: Instructional Area / Course Number / Long Course Title

- MATH / 1310 / College Algebra
- Course ID: 31082 Effective Date (currently active row): 8272012

9. Proposed Catalog Description: (If there are no prerequisites, type in "none".)

Cr: 3. (3-0). Prerequisites: ⁴A satisfactory score on a placement exam or MATH 1300. Description (30 words max.): Students with credit in MATH 1330 or MATH 1431 will not be allowed to enroll in or receive credit for MATH1310. Quadratic equations, inequalities, logarithmic and exponential functions, graphs, elements of the theory of equations, systems of equations.

10. Dean's Signature: _____ Date: _____

Print/Type Name: _____

REQUEST FOR COURSES IN THE CORE CURRICULUM

Originating Department or College: Department of Mathematics

Person Making Request: Charles Peters

Telephone: 713-743-3516

Email: charles@math.uh.edu

Dean's Signature: _____

Date: 2/13/2013

Course Number and Title: MATH 1310: College Algebra

Please attach in separate documents:

Completed CBM003 Add/Change Form with Catalog Description

Syllabus

List the student learning outcomes for the course (Statements of what students will know and be able to do as a result of taking this course. See appended hints for constructing these statements):

Students will be able to apply algebraic rules and transformations to simplify or elaborate on mathematical expressions. Students will understand and be able to apply methods of solution of polynomial equations and will understand the properties of roots of such equations. They will be able to solve systems of linear equations and inequalities. They will understand properties of exponential and logarithmic functions and will be able to solve equations involving these functions. Students will be able to use graphical information and symbolic expression simultaneously in solving mathematical problems. They will be able to translate ordinary language descriptions of a problem into mathematical expression, i.e., they will be able to solve stated problems using algebra.

Component Area for which the course is being proposed (check one):

***Note:** If you check the Component Area Option, you would need to also check a Foundational Component Area.

Communication

American History

Mathematics

Government/Political Science

Language, Philosophy, & Culture

Social & Behavioral Science

Creative Arts

Component Area Option

Life & Physical Sciences

Competency areas addressed by the course (refer to appended chart for competencies that are required and optional in each component area):

Critical Thinking

Teamwork

Communication Skills

Social Responsibility

Empirical & Quantitative Skills

Personal Responsibility

Because we will be assessing student learning outcomes across multiple core courses, assessments assigned in your course must include assessments of the core competencies. For each competency checked above, indicated the specific course assignment(s) which, when completed by students, will provide evidence of the competency. Provide detailed information, such as copies of the paper or project assignment, copies of individual test items, etc. A single assignment may be used to provide data for multiple competencies.

Critical Thinking:

Several examples of exercises and assignments addressing critical thinking competencies are attached.

Communication Skills:

See attached.

Empirical & Quantitative Skills:

See attached.

Teamwork:

[Click here to enter text.](#)

Social Responsibility:

[Click here to enter text.](#)

Personal Responsibility:

[Click here to enter text.](#)

Will the syllabus vary across multiple section of the course? Yes No

If yes, list the assignments that will be constant across sections:

[Click here to enter text.](#)

Inclusion in the core is contingent upon the course being offered and taught at least once every other academic year. Courses will be reviewed for renewal every 5 years.

The department understands that instructors will be expected to provide student work and to participate in university-wide assessments of student work. This could include, but may not be limited to, designing instruments such as rubrics, and scoring work by students in this or other courses. In addition, instructors of core courses may be asked to include brief assessment activities in their course.

Dept. Signature: Charles Pitt

The following courses have been reviewed and approved by the NSM Curriculum Committee to meet the new core requirements. Given the length of the individual submissions I have elected to submit these requests by electronic means only.

Natural Sciences: Core Courses

BIOL 1309 - Human Genetics and Society

BIOL 1310 - General Biology

BIOL 1320 - General Biology

BIOL 1361 - Introduction to Biological Science I

BIOL 1362 - Introduction to Biological Science II

CHEM 1301 - Foundations of Chemistry

CHEM 1331 - Fundamentals of Chemistry I

CHEM 1332 - Fundamentals of Chemistry II

GEOL 1302 - Introduction to Global Climate Change

GEOL 1330 - Physical Geology

GEOL 1340 - Introduction to Earth Systems

GEOL 1350 - Introduction to Meteorology

GEOL 1360 - Introduction to Oceanography

GEOL 1376 - Historical Geology

PHYS 1301 - Introductory General Physics I

PHYS 1302 - Introductory General Physics II

PHYS 1321 - University Physics I

PHYS 1322 - University Physics II

Mathematics: Core Courses

MATH 1310 - College Algebra

MATH 1311 - Elementary Mathematical Modeling

Math/Reasoning: Core Courses

COSC 1306 - Computer Science and Programming

MATH 1330 - Precalculus

MATH 1431 - Calculus I

MATH 1432 - Calculus II

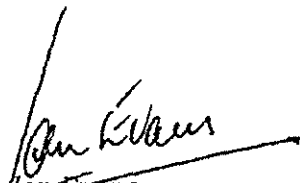
MATH 2311 - Introduction to Probability and Statistics

Writing in the Disciplines: Core Courses

BCHS Biochemistry Lab II

BIOL 3311 - Genetics Lab

PHYS 3313 - Advanced Lab I


Ian Evans
Associate Dean

4/4/13

Spring 2013, Math 1310 Course Syllabus

Section number: This information applies to ALL face-to-face sections
Delivery format: face-to-face lecture

The information contained in this class outline is an abbreviated version of the Course Policies on your instructor's website. To read the full policy statement, please check there.

A student in this class is expected to complete the following assignments:

- 1 5 Regular Exams
- 2 Final Exam
- 3 Online Quizzes – one per week.
- 4 Homework – on each section of the textbook covered in class
- 5 Poppers – in-class quizzes given daily starting the 3rd week of classes.

Grading	Regular Exams:	50% (10% each)
	Final Exam:	15%
	Online Quizzes:	15%
	Daily Classroom Quizzes (Poppers):	10%
	<u>Homework:</u>	<u>10%</u>
	Total:	100%

Text The learning materials for Math 1310, including the textbook, are found online on the CourseWare site at www.casa.uh.edu. Students are required to purchase an access code at the Book Store to access the learning materials.

Course Objectives: The student will master the following topics:

1. An Introduction to Graphs and Lines
2. Solving Equations and Inequalities
3. An Introduction to Functions
4. Polynomial and Rational Functions
5. Exponential and Logarithmic Functions

Whenever possible, and in accordance with 504/ADA guidelines, the University of Houston will attempt to provide reasonable academic accommodations to students who request and require them. Please call 713-743-5400 for more assistance.

College Algebra, Math 1310
Core Curriculum Report
Fall 2012

Math 1310 College Algebra – Topics List

An Introduction to Graphs and Lines

Points, Regions, Distance and Midpoints

Lines

Graphing Equations

Solving 2 x 2 systems of equations

Solving Equations and Inequalities

Linear Equations

Quadratic Equations

Complex Numbers

Linear Inequalities

Absolute Value

An Introduction to Functions

Basic Ideas

Functions and Graphs

Variation

Transforming Functions

Maximum and Minimum Values

Combining Functions

Inverse Functions

Polynomial and Rational Functions

Polynomial Functions

Dividing Polynomials

Roots of Polynomials

Rational Functions

Exponentials and Logarithms

Exponential Functions

The Number e

Logarithms

Properties of Logarithms

Exponential and Logarithmic Equations

Below are some representative questions from various assessment pieces that demonstrate our commitment to these objectives. We begin with Test 2 as Test 1 is a readiness test over prerequisite materials

Part A: Critical Thinking Skills

Developing and deepening **Critical Thinking Skills** is a large part of a student's successful completion of Math 1310. To this end, when we assess a student's work, we use both multiple choice questions and free response questions.

Homework 3 – Question 6 – Multiple Choice

Thomas is walking his dog in the park today. He notices that there are bicycles and tricycles parked on the bike rack at the park. There are a total of 26 vehicles with a total of 63 wheels. How many tricycles are parked at the bike rack?

This question requires students to analyze the information given, and come up with a system of linear equations to solve for the number of bicycles and tricycles. After they solve the equations, they must determine which quantity is the actual answer to the question.

Homework 4 – Question 14 and 15 – Multiple Choice

Sam makes a deposit at the bank which is composed of \$5, \$10 and \$20 bills. If the number of \$5 bills is three more than the number of \$10 bills, the number of \$20 bills is half the number of \$5 bills, and his total deposit was \$270, how many of each type of bill did he deposit?

This is written as a 2-part question. The first question asks the student to identify the algebraic equation needed to solve the problem. The second question asks for the answer to the question posed. The students must use algebra to solve the problem, and must interpret their answer to the algebra problem to give a correct answer to the problem posed.

Homework 6 – Questions 14 and 15 – Multiple Choice

Joseph rents a catering hall to put on a dinner theater. He pays \$225 to rent the space, and an additional \$7 per plate for each dinner served. He then sells tickets for \$15 each.

- (a). Joseph wants to make a profit. Write an inequality that models this situation.*
- (b). How many tickets must he sell to make a profit?*

The students are asked both questions. They must write the algebraic expression for the cost of the dinner for x attendees and recognize the inequality necessary to express the revenue being larger than the cost. They must also recognize that the number of tickets is an integer, and should be rounded up to the next whole number.

Quiz 2 – Question 5 – Multiple Choice

A right triangle's height is three times the length of its base. If the area of the triangle is 54, find the height of the triangle.

The student is asked to identify the area of a triangle formula and express the length of the base in terms of the height.

Quiz 2 – Question 8 – Multiple Choice

Thomas collects dimes and quarters in his change jar. If he has 8 more dimes than quarters, and the total in his change jar is \$32.30, how many of each type of coin is in the jar?

This question asks the students to understand the phrase “8 more than” which often confuses them. They recognize “more than” translates to plus, but they have to think carefully to make sure that they have the correct quantities of each coin.

Test 2 – Question 12 – Multiple Choice

A rectangle's length is twice its width. If the perimeter is 150 cm, find the width of the rectangle.

This question requires students to analyze the information given, determine the appropriate geometry formula to use and correctly solve the equation. Students must also understand that the quantity they are looking for is the width of the rectangle and not the length.

Homework 11 – Question 13 – Multiple Choice

Given the function

$$f(x) = \begin{cases} -4 & \text{if } -5 \leq x < 1 \\ 2 & \text{if } 1 \leq x \leq 3 \end{cases}$$

Which of the following is a true statement about the function?

- (a). *The domain of the function is $(-\infty, \infty)$.*
- (b). *$f(-2) = 2$*
- (c). *The point $(0, -5)$ is on the graph of the function $f(x)$.*
- (d). *The point $(1, 2)$ is on the graph of the function $f(x)$.*
- (e). *None of the above are true.*

This question requires that the student understands the concept of domain and the meaning of the graph of a function. They must also grasp the concept of a piece-wise defined function, and how to evaluate the function at a particular value of x .

Homework 14 – Questions 14 and 15 – Multiple Choice

A ball is thrown upward. The height of the ball, in feet, t seconds after it was thrown is given by the function

$$H(t) = -16t^2 + 64t$$

14. Find the maximum height of the ball.
15. The maximum height of the ball occurs how many seconds after it was thrown?

This question asks the students to find the maximum value of a quadratic function, but they also must recognize what the function represents in order to understand the quantity that is requested.

Quiz 6 – Question 16 – Multiple Choice

The time T it takes to drive from Houston to Denver is inversely proportional to a driver's average speed, S . If it takes 24 hours to drive to Denver at 50 miles per hour, how long will it take a driver to drive from Houston to Denver at an average speed of 60 miles per hour?

This question requires the students organize the information about proportionality, properly write the equation and solve for the constant of proportionality. Then they must use the formula they write to solve the problem.

Test 3 – Question 1 – Multiple Choice

Given the following function, calculate $f(-4)$.

$$f(x) = \begin{cases} 3x - 9 & x < -3 \\ x^2 & -3 \leq x \end{cases}$$

The question gives all the information needed. It is up to the student to discern exactly which part of the domain -4 lies in and calculate the answer. This really tests whether or not a student understands piece-wise defined functions and the abbreviated notation that conveys information

Test 3 – Question 13 – Free Response

Given the following transformed function: $f(x) = -|x - 2|$,

- I State the basic function.
- II State the transformations needed to go from the basic function to the function given.
- III Graph the basic function and label its key point(s). Then graph the curve that results from each transformation and label each curve. Label the key point(s) on the graph of the final transformed function.

With this question a student must decode and recode instructions while recording the instructions in English. A student must know the “parent” graph and figure out the resulting graph. It requires both visualizing skills and analysis to successfully answer each part of the question.

Test 4 – Question 6 – Multiple Choice

Find any vertical asymptotes for the function $f(x) = \frac{x^2 + 5x + 6}{x^2 - x - 6}$

This is another multi-pronged question. Students must discern that there are no common factors between the numerator and denominator to realize that there are two asymptotes not one. The answers provide several answers with two vertical asymptotes and several with one asymptote as the answer.

Accurate factoring is essential as a basic skill. Then interpreting the results of that work is essential to success.

Test 5 – Question 1 – Multiple Choice

Find the exponential function of the form $f(x) = a^x$, which passes through the points (0, 1) and (2, 36).

This is a difficult question for many students. They are unused to knowing the coordinates and have difficulty making the transition to finding a constant (the base) rather than a variable. It is a good question for developing the skill of taking what you know and finding what you don't know.

Test 5 – Question 19 – Multiple Choice

Use transformations to determine the coordinates of the key point (0, 1) on the graph of

$$f(x) = 8^{x+4} .$$

This question checks on the quality of a student's understanding of transformations. Most can tell you that "x + 4" means go left 4 units, but having the transformation in the exponent place is new to them. It really tests that they've learned transformations and that they understand exponential functions. Plus, the visual aspect of coming up with point coordinates instead of a graph require strong visualization skills.

Part B: Communication Skills

Communication Skills are important in this course. We constantly stress the notion of being aware of what is being asked and how to effectively interpret an answer after the algebraic manipulation of the numbers and symbols.

Test 2 – Question 15 – Free Response

For the following situation, answer the following questions:

- I. Define the variable*
- II. Write an equation*
- II. Solve the equation*
- IV. State the answer to the question, including appropriate units*

Anna collects pennies and dimes in her coin purse. If she have 7 more dimes than pennies and the total amount in her purse is \$1.91, how many of each coin are in her purse?

This question has a student carefully and methodically communicate the basic situation in math expressions and interpret the numerical answer at the end. They are graded on the answer to the question, in words, not just solving the algebraic equation.

Test 2 – Question 13 – Free Response

Solve the following equation by completing the square: $x^2 + 6x = -1$

This question requires that the student use the requested method of solution for the quadratic equation. The communication skill that is particularly important is the interpretation of the word “solve”. Students frequently successfully complete the square and neglect to finish the problem by finding the correct values of x . The problem is also designed to not be a quadratic that can be factored into linear factors with integer roots. Finding both roots successfully communicates complete understanding of solving an equation with a square root.

Test 2 – Question 14 – Free Response

Solve $\frac{1}{2}|x-6|=3$

The students are expected to correctly interpret the absolute value function. Students are graded on correct mathematical procedure, notation and the correct answers.

Test 3 – Question 13 – Free Response

Given the following transformed function:

$$f(x) = -|x - 2|$$

- I. State the basic function.
- II. State the transformations needed to go from the basic function to the function given.
- III. Graph by transformation: Graph the basic function and label its key point(s). Then graph the curve that results from each transformation, and label each curve. Label the key point(s) on the graph of the final transformed function

This question requires the student to not just graph the function given, but describe in words and picture form how the parent function was transformed.

Test 3 – Question 8 – Multiple Choice

Find the maximum or minimum value of the function: $f(x) = x^2 + 14x + 50$

A student must transform the given equation in one of two different ways to actually get the y -value at the vertex and then interpret the shape of the graph and whether it is cupped up or down to answer the question. A series of manipulations resulting in an interpretation.

Test 3 – Question 11 – Multiple Choice

What transformation is needed to go from the graph of the basic function $f(x) = \sqrt{x}$ to the graph of $g(x) = -(\sqrt{x-10})$. Answers look like: “a) Reflect across the x -axis and then shift up 10 units.”

Students must toggle between the functional form and the “coded” instructions and the English write out of the instructions. Important in this question is order of operations. The student must decide whether the reflection goes first or last – a crucial component of the translation.

Homework 20 – Question 11 – Multiple Choice

Given the function $f(x) = x^4 - 81$

State the roots of the function and the multiplicities of each root.

This question requires that the student understand the words “roots”, algebraically find the roots and then understand multiplicities. The answers read “the roots are 3 with multiplicity of 1, -3 with multiplicity of 1, 3i with multiplicity of 1 and -3i with multiplicity of one.

Test 4 – Question 10 – Free Response

Graph $f(x) = (x+1)(x-2)^2$

On your graph: Clearly label the x-intercept(s) and y-intercept. Show the correct end behavior and the correct behavior at each x-intercept.

Students must find the x-intercepts and y-intercepts, then understand how to use the information given in the factored form of the polynomial to sketch the shape of the graph at the intercepts. They must also understand the end behavior of the graph. Finally, they must use all this information to connect the graph in a smooth curve.

Test 4 – Question 11 – Free Response

Graph $f(x) = \frac{x-2}{x+6}$

State the following and clearly label on your graph:

- a) x-intercept(s)
- b) hole(s)
- c) y-intercept
- d) vertical asymptote(s)
- e) horizontal asymptote(s)

This tests whether a student knows the vocabulary of graphing rational functions and whether or not these words are connected to visual representations.

Homework 23 – Question 5 – Multiple Choice

Which of the following points does not lie on the graph of the function $g(x) = 2^x$?

- A. $(0, 1)$
- B. $(2, 4)$
- C. $(1, 0)$
- D. $(-1, \frac{1}{2})$
- E. All of the above points are on the graph

The students are expected to understand when a point is on the graph, and evaluate the function at each of the x-coordinates to determine for which point the y-value is not the function value.

Test 5 – Question 5 – Multiple Choice

Evaluate the given expression if it is defined, otherwise state that it is undefined.

$$\log_4(4^6)$$

- This is a good question for the skill of simplifying given information. Giving the student the option of declaring the expression to be “undefined” ensures that the student really understands what is in the domain of a logarithm.

Quiz 12 – Question 16 – Multiple Choice

Which of the following is equivalent to $6^{-8} = \frac{1}{x}$?

- A. $\log_{-8}(6) = \frac{1}{x}$
- B. $\log_{-8}\left(\frac{1}{x}\right) = 6$
- C. $\log_6(x) = 8$
- D. $\log_x(-8) = 6$
- E. $\log_x(6) = -8$
- F. None of the above

The question requires the student to understand the relationship between the logarithmic function and the exponential function and express the equation in the proper format. Furthermore, recognizing the correct answer, “c”, requires that the student understand negative exponents and the laws for exponents inside logarithms.

Part C: Empirical and Quantitative Skills

Empirical and Quantitative Skills are the essence of the basics of any mathematics course. We have many questions that focus on manipulation of data and facts.

Homework 1 – Questions 6-8

Add $\frac{1}{2} + \frac{3}{5}$

Divide $\frac{4}{15} \div \frac{5}{6}$

Simplify 3^{-1}

Our college algebra course is designed to be taught without the use of a calculator on the tests. Therefore the fundamental quantitative skills involved in basic arithmetic are stressed from the beginning and throughout the course.

Test 2 – Question 12 – Multiple Choice

A rectangle's length is twice it's width. If the perimeter is 60 cm, find the width of the rectangle.

This question gets to the heart of application problems. It is a way for a student to combine given facts with a known formula to come up with the specific conclusion.

Quiz 2 – Question 6 – Multiple Choice

You need to order carpet for a room that has a length that is twice its width. If the area of the room is 98 square meters, find the width of the room.

Similar to the previous question, this question asks the students to process the given information and choose the correct geometric formula to use to solve the problem. The mixture of different types of information on the questions about rectangles requires the students to think and process before choosing their formulas and solving.

Homework 12 – Question 15 – Multiple Choice

The interest earned on money invested in a savings account is jointly proportional to the amount initially invested and the length of time of the investment. If \$250 is invested for 2 years, it earns \$25 in interest. Ho much interest would be earned if \$200 was invested for 3 years?

This tests the understanding of proportion and asks the student to interpret the given numbers appropriately.

Homework 16 – Question 3 – Multiple Choice

Given the function g defined by the following table of values, is g one-to-one?

X	$g(x)$
-4	5
-3	6
-2	8
0	11
3	23
5	26
6	30

- A. The function g is one-to-one
- B. The function g is NOT one-to-one.

To answer this question, a student must understand functions given in tabular form. Then, they must understand the concept of a one-to-one function and interpret the data properly.

Test 3 – Question 6 – Multiple Choice

A graph is given and the student is to answer “Which of the following functions matches the graph given?”

This stresses basic pattern recognition skills and includes the extended work of matching the recognized pattern in graphing to the algebra representation of the formula.

This type of question appears frequently as the course moves through families of functions. Pattern recognition in the form of seeing a graph and selecting the correct equation is a large part of this course.

Homework 13 – Question 13 – Multiple Choice

The student is given a graph and asked to identify the function graphed. The homework version of the question, which occurs in multiple homework assignments as we study different functions (square roots, quadratics, cubics, polynomials, rational and exponential functions) includes a broader range of possible choices than test questions. The possibilities include different parent functions with similar transformations applied. The student has to recognize both the parent function and the appropriate transformations.

Test 3 – Question 15 – Free Response

Find $f^{-1}(x)$ for the function $f(x) = \frac{1}{x-2}$.

This question involves several stages of thinking. Realizing that the superscript means “inverse” and not “reciprocal” is the all-important first step. Knowing the appropriate process to find the inverse and then, being able to be confident that what came of the process is correct.

Quiz 8 – Question 9 – Multiple Choice

Let $f(x) = 10x + 4$ and $g(x) = x^2 + 3x$, find $(g \circ f)(2)$.

This question assesses both evaluating a function and how to perform function composition. Although it is multiple choice, the numerical choices do not afford any hints to the correct procedure. Therefore, the students must apply the correct procedure to arrive at the right answer, they cannot guess.

Test 4 – Problem 9 – Multiple Choice

Find a polynomial with integer coefficients that satisfies the following conditions:

Degree of the polynomial: 3

Zeros: $1, -4i, 4i$

Constant coefficient: -48

This question has a student really pull together many facts: exactly what is the information given and where does it fit into the equation of a polynomial? A student who can successfully work out the answer to this question really does understand what information is given in an equation. Furthermore, with complex roots, this question moves beyond Real number work into the larger world of Complex numbers.

Test 5 – Question 15 – Multiple Choice

Solve for x given that $3^x = 6$.

This question asks a familiar question “solve for x ” with an unfamiliar context: the variable is in the exponent place. If the student has internalized the new information about various bases and solving with exponents, this is a simple question. Most students struggle to learn how to handle this scenario and have a real breakthrough in skill level when they can handle this type of question.

Test 5 – Question 18 – Multiple Choice

Solve for x , given that

$$\ln(x) + \ln(x - 3) = \ln(10)$$

This question tests the students understanding of logarithms on multiple levels. They must use the laws of logarithms to break this question down into solving a quadratic equation. Once they have the solutions, they must check the solutions in the original equation to see if the number is in the domain of the given logarithmic functions and throw out the answer that is not in the domain.