MA - 109 - COLLEGE ALGEBRA

Course Change with Core

Course Change with Core

* denotes required fields

Prefix:*	MA	Number:*	109

Check if same as current ☑ Same as current

What type of change is being proposed?*
- ☑ Major Change
- ☐ Major – Change Content
- ☐ Major – Add Distance Learning
- ☐ Minor - change in number within the same hundred series, exception 600-799 is the same "hundred series"
- ☐ Minor - editorial change in course title or description which does not imply change in content or emphasis
- ☐ Minor - a change in prerequisite(s) which does not imply a change in course content or emphasis, or which is made necessary by the elimination or significant alteration of the prerequisite(s)
- ☐ Minor - a cross listing of a course as described above

Is this course clinical? Also select "Yes" if the course is not clinical but you wish for the course to be reviewed by the HCCC.*
- ○ Yes
- ◉ No

1. General Information

a. Submitted by the College of:* College of Arts & Sciences (8E000)

b. Department/ Division:* Mathematics (8E080)

c. Is there a change in "ownership" of the course?* ○ Yes ◉ No

If YES, what college/ department will offer the course instead?	

e. Contact Person Name:*	Alberto Corso

Email:*	alberto.corso@uky.edu	Phone:*	(859) 257-3167

f. Requested Effective Date:*	⦿ Semester Following Approval ◯ Specific Term

If specific term:	

Courses are typically made effective for the semester following approval. No course will be made effective until all approvals are received.

2. Designation and Description of Proposed Course.

a. Distance Learning (DL) Status:	◯ N/A ⦿ Already approved for DL* ◯ Please Add ◯ Please Drop

Already approved for DL	☑ *If already approved for DL, the Distance Learning Form must also be submitted unless the department affirms (by checking this box) that the proposed changes do not affect DL delivery.

The FULL title of the course needs to be written out in the first box and IF the title is more than 40 characters, THEN, the title needs to be shortened for the insertion on the transcript. The full title of the course is what is put in the bulletin and the second is what is inserted on the transcript.

b. Full Title:*	COLLEGE ALGEBRA

c. Transcript Title (if full title is more than 40 characters):	

ADD Cross-listing (Prefix & Number):	

d. Current Cross-listing:*	⦿ N/A ◯ Currently Cross-listed

REMOVE Cross-listing (Prefix &	

Number):

The chair of the cross-listing department must approve the cross-listing.

Currently Cross-listed with (Prefix & Number):	

e. Courses must be described by at least one of the meeting patterns below. Include number of actual contact hours for each meeting pattern type.

Generally, undergrad courses are developed such that one semester hr of credit represents 1 hr of classroom meeting per wk for a semester, exclusive of any lab meeting. Lab meeting generally represents at least two hrs per wk for a semester for 1 credit hour. (See SR 5.2.1.)

Lecture:	3
Laboratory:	
Clinical:	
Colloquium:	
Seminar:	
Studio:	
Recitation:	0
Discussion:	
Indep. Study:	
Practicum:	
Research:	
Residency:	
Other:	
Please Explain	

f. Grading System:*   ⦿ Letter (A, B, C, etc.)
                      ◯ Pass/Fail

○ Medicine Numeric Grade

○ Graduate Level Grade Scale

g. Number of credit hours: *	3

h. Is the course currently repeatable? *	○ Yes ⊙ No

Proposed: to be repeatable for additional credit? *	○ Yes ⊙ No

If YES, Maximum number of credit hours:	

If YES, Will this course allow multiple registrations during the same semester?	○ Yes ⊙ No

i. Course Description for Bulletin: *	Selected topics in algebra. Develops manipulative algebraic skills and mathematical reasoning required for further study in mathematics and use in mathematical modeling. Includes brief review of basic algebra, quadratic formula, systems of linear equations, introduction to functions and graphing. This course is not available for credit to persons who have received credit in any mathematics course of a higher number with the exceptions of MA 111, 112, 123, 162, 201 and 202. Credit not available on the basis of special examination.

j. Prerequisites, if any:	Two years of high school algebra and a Math ACT score of 21 or above or a Math SAT score of 510 or above; or UK 096; or appropriate MathIndex; or grade of B or better in MA 111. Math placement test recommended.

3. Is this course taught off campus?

a. *	⊙ Yes ○ No

If YES, enter the off campus address:	Dual credit through Fayette County Public School System

4. Are significant changes in content/ student learning outcomes of the course being proposed?

a.*	◉ Yes ○ No

If YES, explain and offer brief rationale:	We are proposing to make this course satisfy the UK Core requirement for the Quantitative Foundation area.

5. Course Relationship to Program(s).

a. Are there other depts and/or pgms that could be affected by the proposed change?*	◉ Yes ○ No

If YES, identify the depts. and/or pgms:	Some departments may want to use this course to satisfy their UK Core requirements for the Quantitative Foundations area.

b. Will modifying this course result in a new requirement for ANY program?*	○ Yes ◉ No

If YES, list the program(s) here:	

In order to change a program, a program change form must also be submitted.

6. Information to be Placed on Syllabus.

a. ☐ Check box if changed to 400G or 500.

If changed to 400G- or 500-level course you must send in a syllabus and you must include the differentiation between undergraduate and graduate students by: (i) requiring additional assignments by the graduate students; and/or (ii) establishing different grading criteria in the course for graduate students. (See SR 3.1.4.)

Distance Learning Form

This form must accompany every submission of a new/change course form that requests a change in delivery mode. All fields are required!

Introduction/Definition: For the purposes of the Commission on Colleges Southern Association of Colleges and Schools accreditation review, *distance learning* is defined as a formal educational process in which the majority of the instruction (interaction between students and instructors and among students) in a course occurs when students and instructors are not in the same place. Instruction may be synchronous or asynchronous. A distance learning (DL) course may employ correspondence study, or audio, video, or computer technologies.

A number of specific requirements are listed for DL courses. The *department* **proposing the change in delivery method is responsible for ensuring that the requirements below are satisfied at the individual course level.** It is the responsibility of the instructor to have read and understood the university-level assurances regarding an equivalent experience for students utilizing DL (available at http://www.uky.edu/USC/New/forms.htm).

Instructor Name:	Instructor Email:

Check the method below   ◯ Internet/Web-based

Assignments or exercises that enable students to employ and evaluate formal interpersonal and small group communication skills effectively. These assignments must represent at least 15% of the final grade.

Please explain:

Reviewer's Comments

Quantitative Foundations

Please complete this section if you are seeking approval for this course to be included in this UK Core area. If not, then collapse this section and skip to the next section.

Quantitative Foundations ✓ Check if requesting approval.

Using the course syllabus as a reference, identify when and how the following learning outcomes are addressed in the course. Since learning outcomes will likely be addressed

multiple ways within the same syllabus, please identify a representative example (or examples) for each outcome.

1. Students must demonstrate proficiency with number sense (e.g., order of magnitude, estimation, comparisons, effect of operations)

Date/ location on syllabus or assignment:	Learning Objective #1 A Bit Of Review (2nd week)

Brief Description:	See the attached form for details.

2. Students must demonstrate proficiency with functional relationships between two or more sets of variable values (i.e., when one or more variables depend upon, or are functions of, other variables)

Date/ location on syllabus or assignment:	(Recurring theme) Learning objectives #2 through #4 Exams 2 and 3 Systems A,B,C and Functions A-F.

Brief Description: See the attached form for details.

3. Students must demonstrate proficiency in relating different representations of such relations (e.g., algebraically or symbolically, as tables of values, as graphs, and verbally)

Date/ location on syllabus or assignment: Learning objective #3
Scattered problems on many assignments.

Brief Description: See the attached form for details.

4. Students must demonstrate understanding of relations between numerical values.

Date/ location on syllabus or assignment: Inequalities (8th week)

Brief Description: See the attached form for details.

5. Students must demonstrate that they can apply fundamental elements of mathematical, logical, or statistical knowledge to model and solve problems drawn from real life.

a) Students must be able to recast and formulate everyday problems into appropriate mathematical or logistical systems, represent those problems symbolically, and express them visually or verbally.

Date/ location on syllabus or assignment: Learning objectives #3 and #5.
Assignment: "Applied" (9th week)

Brief Description: See the attached form for details.

b) Students must be able to apply the rules, procedures, and techniques of appropriate deductive systems to analyze and solve problems.

Date/ location on syllabus or assignment:	Learning objectives #4 and #5. Assignments: "Solving Equations A-D" (2nd-4th week)

Brief Description:	See the attached form for details.

c) Students must be able to apply correct methods of argument and proof to validate (or invalidate) their analyses, confirm their results, and to consider alternative solutions.

Date/ location on syllabus or assignment:	Learning objective #1, #4, and #6 "Extraneous solutions" in Solving Equations (radical and absolute values)

Brief Description:	See the attached form for details.

d) Students must be able to interpret and communicate their results in various forms, including in writing and speech, graphically and numerically.

Date/ location on syllabus or assignment:	Learning Objective #3 Written Project (14th week)
Brief Description:	Students will present a complete analysis of a modelling problem, including supporting paragraphs of explanation, figures (graphs and tables of values), as well as a comparison of two competing possible solutions, explaining the merits and drawbacks of both.

e) Students must be able to identify and evaluate arguments that contain erroneous or fallacious reasoning, and detect/describe the limitations of particular models or misinterpretations of data, graphs, and descriptive statistics.

Date/ location on syllabus or assignment:	Learning Objective #1 and #6 Sample exam question (3rd exam, 13th week)
Brief Description:	See the attached form for details.

f) Students must address Information Literacy as presented within curriculum for the science of quantitative reasoning. This involves problem solving, the use of estimation, thinking strategies for basic facts, formulating and investigating questions from problem situations, use of computers and calculators, or other technologies.

Date/ location on syllabus or assignment:	Learning objective #6 and #8 "Using Tech Wisely" (7th week)

Brief Description:	See the attached form for details.

At least 30% of the course addresses the items 1 – 4 on this checklist, and at least 40% of the course addresses items 5 a) – e) on the checklist.

Reviewer's Comments	

ALBERTO CORSO

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November 17, 2016

Dear Colleagues,

On behalf of the Department of Mathematics, I am putting forward a course change proposal petitioning for MA 109 (College Algebra) to be approved to satisfy the UK Core requirements for the Quantitative Foundations Outcome (QFO). This proposal addresses a request by a number of departments, here at UK, whose students on one hand do not need a Calculus-based course to satisfy the QFO (currently MA 113, MA 123 and MA 137) but on the other hand need a more technical course than our only approved alternative (MA 111).

There are two documents that accompany the approval form and the present cover letter:

- `MA109CoreSyllabus.pdf`
- `qfo-review.pdf`

Both documents strive to carefully address how the course has been redesigned to meet the UK Core general education requirements. In particular, a greater emphasis has been put to address the following abilities:
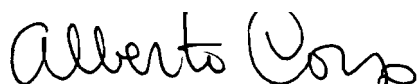
- ability to explain information presented in mathematical forms through equations, graphs, tables, words;
- ability to convert relevant information into various mathematical forms through equations, graphs, tables, words;
- ability with calculations;
- ability to make judgments and draw appropriate conclusions based on the quantitative analysis of data, while recognizing the limits of this analysis;
- ability to make and evaluate important assumptions in estimation, modeling, and data analysis;
- ability in expressing quantitative evidence in support of the argument or purpose of the work.

The prerequisites for the course have also been slightly modified to include, for example, the new pathway to MA 109 provided by the recently approved UK 096 course.

MA 109 has already been approved for distance learning (DL). That delivery option will be unaffected other than being updated to meet the new UK Core status. That's why we haven't resubmitted documentation about DL.

Please feel free to contact me in the case you need additional information about our proposal.

Sincerely yours,

Alberto Corso

Alberto Corso, alberto.corso@uky.edu
Director of Undergraduate Studies
Associate Professor of Mathematics

Course Review Form
Quantitative Foundations

Course: MA109 - College Algebra

Using the course syllabus as a reference, identify when and how the following learning outcomes are addressed in the course. Since learning outcomes will likely be addressed multiple ways within the same syllabus, please identify a representative example (or examples) for each outcome.

☐ 1. Students must demonstrate proficiency with number sense (e.g., order of magnitude, estimation, comparisons, effect of operations)

Date/location on syllabus or assignment:
Learning Objective #1
A Bit Of Review (2nd week)

Brief Description:

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6. ⊕ **Question Details**   120L IntroWA number tolerance_with hint [3553317]   -

Tolerance
By default, your numerical entry is scored as correct if it is within 1% of the correct answer. A rule of thumb is always to enter at least 3 digits for numerical questions. If the correct answer is 7.48709, which of the following entries would be counted as correct? That is, which entries are within WebAssign's default tolerance? (Select all that apply.)

HINT: Numbers that are "within 1% of the correct answer" are any values that are less than **the correct answer + 1%** (TOP of range) and greater than **the correct answer - 1%** (BOTTOM of range).

☐ 7.64

☐ 7.5545

☐ 7.49

☐ 7.3299

☐ 7.420

☐ 7.3

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8. ⊕ **Question Details**   Order of Operations 3 [1753907]   -

What is the order of the steps that are being applied to x?

$2 - (x + 1)^3$

1. [Add 1   ⬍]

2. [Raise to the Third Power ⬍]

3. [Negate   ⬍]

4. [Add 2   ⬍]

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2. Students must demonstrate proficiency with functional relationships between two or more sets of variable values (i.e., when one or more variables depend upon, or are functions of, other variables)

Date/location on syllabus or assignment:
(Recurring theme)
Learning objectives #2 through #4
Exams 2 and 3
Systems A,B,C and Functions A-F.

Brief Description:

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2. ⊕ **Question Details** -

Determine whether or not the given table could possibly be a table of values of a function.

○ Yes, it could be a function.

○ No, it could not be a function.

Input	2	5	8	11	12
Output	-4	-4	-2	5	-5

Give a reason for your answer.

○ Two output values are associated with a single input value.

○ Two input values are associated with a single output value.

○ For every input there is a unique output.

○ For every output there is a unique input.

Need Help? [Read It] [Watch It] [Master It]

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11. ⊕ **Question Details** -

Let

$$g(x) = \begin{cases} x+1 & \text{if } x \leq 1 \\ |x-12| & \text{if } 1 < x \leq 3 \\ 2x+4 & \text{if } 3 < x < 6 \\ 1/x & \text{if } 6 \leq x \end{cases}$$

$g(2) = \boxed{}$

3. Students must demonstrate proficiency in relating different representations of such relations (e.g., algebraically or symbolically, as tables of values, as graphs, and verbally)
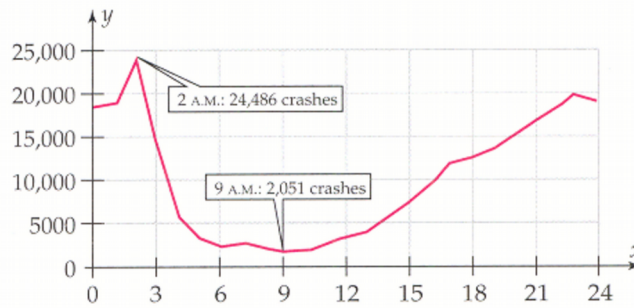
Date/location on syllabus or assignment:
Learning objective #3
Scattered problems on many assignments.

Brief Description:

The graph shows the total number of alcohol-related car crashes in Ohio at a particular time of day for the years 1991-2000. Time is measured in hours after midnight.

(a) During what interval is the number of crashes below **5,000**? (Enter the interval that contains smaller numbers first.)

([   ] , [   ])

(b) During what interval is the number of crashes above **5,000**? (Enter the interval that contains smaller numbers first.)

([   ] , [   ]) ∪ ([   ] , [   ])

Need Help? [Read It]

The amount of state income tax residents pay depends on their income. The way that the income determines the tax is given by the following tax law.

Income		Tax
At least	**But Less Than**	
$0	$15,000	$0
$15,000	$60,000	4% of amount over $15,000
$60,000		$2,400 + 10% of amount over $60,000

Find four different numbers in the domain of this function that produce the same output (number in the range). (Enter your answers from smallest to largest.)

$ [   ]
$ [   ]
$ [   ]
$ [   ]

Need Help? [Read It]

☐ 4. Students must demonstrate understanding of relations between numerical values.

Date/location on syllabus or assignment:
Inequalities (8th week)

Brief Description:

Write the given expression without using absolute values.

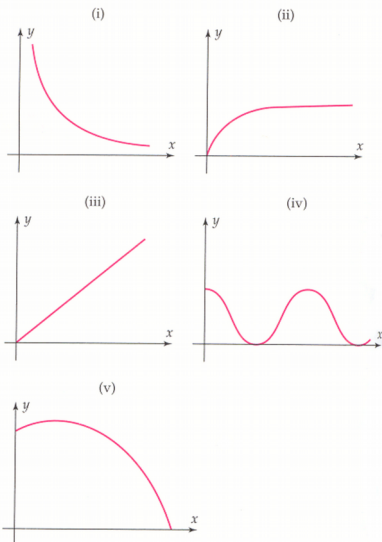$$|a - 7| \text{ if } a < 7$$

- ○ $-7 - a$
- ○ $7 - a$
- ○ a
- ○ $a - 7$
- ○ $7 + a$

Need Help? [Read It]

11. ⊕ Question Details

Match each of the following functions with the graph that best fits the situation.

(i) (ii)

(iii) (iv)

(v)

(a) The distance a woman runs at constant speed as a function of time.
[---Select--- ⬍]

(b) The height of a ball thrown from the top of a building as a function of time.
[---Select--- ⬍]

(c) The phases of the moon as a function of time.
[---Select--- ⬍]

(d) The demand for a product as a function of its price.
[---Select--- ⬍]

(e) The temperature of an oven turned on and set to 350° as a function of time.
[---Select--- ⬍]

☐ 5. Students must demonstrate that they can apply fundamental elements of mathematical, logical, or statistical knowledge to model and solve problems drawn from real life.

　　a) Students must be able to recast and formulate everyday problems into appropriate mathematical or logistical systems, represent those problems symbolically, and express them visually or verbally.

　　Date/location on syllabus or assignment:

Learning objectives #3 and #5.
Assignment: "Applied" (9ᵗʰ week)

Brief Description:

A rectangle has perimeter of 45 centimeters and an area of 93.5 square centimeters. What are its dimensions?
Decide what is being asked for, and label the unknown quantities. Then translate the verbal statements in the problem and the relationships between the known and unknown quantities into mathematical language, using a table. You need not find an equation to be solved.
Please label the height of the rectangle as *x* and its length as *y*.

English Language	Mathematical Language
The height of the rectangle is ___ and the length of the rectangle is___.	
The rectangle's perimeter is 45.	
The rectangle's area is 93.5.	

English Language	Mathematical Language
The height of the rectangle is ___ and the length of the rectangle is___.	*x, y*
The rectangle's perimeter is 45.	*xy* = 45
The rectangle's area is 93.5.	2*x* + 2*y* = 93.5

A box with a square base of side *y* is six times higher than it is wide. Express the volume *V* of the box as a function of *y*.

V(*y*) = [   ]

Need Help? [**Read It**]

A bicycle factory has weekly fixed costs of $21000. In addition, the material and labor costs for each bicycle are $145. Express the total weekly cost C as a function of the number x of bicycles that are made.

- ○ $C = 435x + 21000$
- ○ $C = 145x + 21000$
- ○ $C = 145x + 20855$
- ○ $C = 435x + 20855$
- ○ $C = 290x + 10400$

Need Help? [**Read It**]

b) Students must be able to apply the rules, procedures, and techniques of appropriate deductive systems to analyze and solve problems.

Date/location on syllabus or assignment:
Learning objectives #4 and #5.
Assignments: "Solving Equations A-D" (2ⁿᵈ-4ᵗʰ week)

Brief Description:

Solve for x.

$$\frac{5}{x-1} + \frac{3}{(x-1)(x+5)} = \frac{2}{x+5}$$

$x =$ [   ]

⊕ symbolic formatting help

Data from the U.S. Department of Health and Human Services indicates that the cumulative number N of reported cases of AIDS in the United States in year x can be approximated by the equation below, where $x = 0$ corresponds to 1980. In what year did the total reach 650000?

$$N = 3362.1x^2 - 17270x + 24043$$

○ 1995
○ 1996
○ 1999
○ 1994
○ 2000

Need Help? [**Read It**]

Find a number k such that the given equation has exactly one real solution.

$$x^2 - kx + 4 = 0$$

$k =$ [   ]

Need Help? [**Read It**]

c) Students must be able to apply correct methods of argument and proof to validate (or invalidate) their analyses, confirm their results, and to consider alternative solutions.

Date/location on syllabus or assignment:
Learning objective #1, #4, and #6
"Extraneous solutions" in Solving Equations (radical and absolute values)

Brief Description:

Solve the equation for x.

$$\sqrt{2x + 41} = x + 3$$

The standard operations to solve this problem are to "square both sides" and solve the resulting quadratic, getting 2x + 41 = (x+3)^2, then x=-8 and x=4. However x=-8 gives sqrt(25) = -5, so is not a solution to the original problem, only the transformed problem. Students must check their solutions as part of this method.

d) Students must be able to interpret and communicate their results in various forms, including in writing and speech, graphically and numerically.

Date/location on syllabus or assignment:
Learning Objective #3
Written Project (14th week)

Brief Description:
Students will present a complete analysis of a modelling problem, including supporting paragraphs of explanation, figures (graphs and tables of values), as well as a comparison of two competing possible solutions, explaining the merits and drawbacks of both.

e) Students must be able to identify and evaluate arguments that contain erroneous or fallacious reasoning, and detect/describe the limitations of particular models or misinterpretations of data, graphs, and descriptive statistics.

Date/location on syllabus or assignment:

Learning Objective #1 and #6
Sample exam question (3rd exam, 13th week)

Brief Description:

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14. The amount of water w (in liters) in a leaky bucket after t seconds is given by the function

$$w(t) = 0.1t^2 - t + 2.5$$

This reflects the swift initial decrease in volume, followed by a slower trickle. What is the most serious deficiency of this model?

Possibilities:

(a) Measuring volume in liters does not allow for small quantities of water.

(b) Harrison's law of hydraulics states that water leaves a bucket at a linear rate.

(c) After 10 seconds, the model predicts that $w(10) = 2.5$, the same value as $w(0)$, so that the bucket returns to full after draining.

(d) After 5 seconds, the model predicts that $w(5) = 0$, the bucket is empty.

(e) To determine how much water is in the bucket, one must solve a quadratic equation.

f)   Students must address Information Literacy as presented within curriculum for the science of quantitative reasoning. This involves problem solving, the use of estimation, thinking strategies for basic facts, formulating and investigating questions from problem situations, use of computers and calculators, or other technologies.

Date/location on syllabus or assignment:
Learning objective #6 and #8
"Using Tech Wisely" (7ᵗʰ week)

Brief Description:

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14. ⊕ **Question Details**   Algebraically vs. Graphically 2 [1767406]   -

Which of the following equations should you approximate solutions to graphically? (This means that you can not solve the equation algebraically. You do not need to solve the equations.) (Select all that apply.)

☐ $x^2 + 7 = x^3 - 15$

☐ $x + 7 = \sqrt{x - 15}$

☐ $x^2 + 7 = \sqrt{x - 15}$

☐ $x^2 + 7 = x - 15$

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11. ⊕ **Question Details**   HPreCalc5 2.2.032.MC. [960122]   -

Use algebraic, graphical, or numerical methods to find all real solutions of the equation, approximating when necessary to four decimal places.

$$|x^3 + 3| = 7 + x - x^2$$

○ There are no real solutions.

○ $x \approx -1.7388, 1.4856$

○ $x \approx -1.7374, 1.4856$

○ $x \approx -1.7388, 1.4842$

○ $x \approx -1.7374, 1.4842$

Need Help? [Read It] [Watch It] [Master It]

☐   At least 30% of the course addresses the items 1 – 4 on this checklist, and at least 40% of the course addresses items 5 a) – e) on the checklist.

Reviewer's Comments

MA109 Fall 2017 - College Algebra

Course and instructor demographics

MA 109 is a 3 credit hour class taught by several instructors in several sections. For office hours, meeting times, and contact information, please see the tables below.

Instructors

It is very important to keep up with your class and to inform your instructor as early as possible of any problems or concerns. Many instructors have multiple hundreds of students, and so there may be delays or special requirements needed to handle what may appear to be simple problems. On the other hand our instructors are highly trained professionals and may be able to help you solve what seem like insurmountable challenges. In either case, the more time the instructor has to consider your case, the more likely you are to have a good result.

Instructors hold drop-in office hours at the times and places listed below. You can stop by to ask questions about the course material or structure. Most instructors also are available in the Mathskeller where you can ask them (or any other instructor present) for help in the course.

Instructor	Email	Office Location	Office Phone	Office Hours
{{{instructor.name}}}	{{#instructor.email|email}} {{{email}}}{{/email}}	{{{instructor.office}}}	{{{instructor.officePhone}}}	{{{instructor.officeHours}}} {{^instructor.officeHours}}by appointment{{/}}

Sections

Active, engaged class participation is required in all sections. Make sure you know when and where your class meets and make sure to bring appropriate materials to class (a way to view the textbook, a place to take notes, any calculator you want to practice using). Your active, engaged class participation is a major component of your final grade.

The rooms for your first three exams are also listed:

Section	Instructor	Room	Time	Exam room	Final room
{{{classy.section}}}	{{#classy.instructor|instructorKey}} {{#info.instructors[instructorKey]|instructor}} {{{instructor.name}}} {{/instructorKey}}{{/instructor}}	{{{classy.room}}}	{{{classy.days}}} {{{classy.beg}}}– {{{classy.end}}}	{{{classy.examRoom}}}	{{{classy.finalRoom}}}
{{{rec.section}}}	{{#rec.instructor|instructorKey}} {{#info.instructors[instructorKey]|instructor}} {{{instructor.name}}} {{/instructorKey}}{{/instructor}}	{{{rec.room}}}	{{{rec.days}}} {{{rec.beg}}}– {{{rec.end}}}	{{{rec.examRoom}}}	{{{rec.finalRoom}}}

Course description

College Algebra covers selected topics in algebra, such as a review of grade school algebra, quadratic formula, systems of linear equations, introduction to functions and graphing. Please see this more detailed schedule with supporting lecture notes and worksheets. In particular, we will cover solving equations (linear, quadratic, power, radical, and absolute value equations, as well as equations mentioning the unknown only once), graphing on the Cartesian coordinate system (with special emphasis on lines, their slope, perpendicular and parallel lines), solving systems of equations (with substitution and elimination, both linear and non-linear), using technology (such as graphing calculators and numerical root finders), solving applied problems,

inequalities, and general functions, with special emphasis on exponential, logarithmic, polynomial, and rational functions.

Course Bulletin

The 2017-2018 Bulletin describes this 3 credit hour course as

> *Selected topics in algebra. Develops manipulative algebraic skills and mathematical reasoning required for further study in mathematics and use in mathematical modelling. Includes brief review of basic algebra, quadratic formula, systems of linear equations, introduction to functions and graphing, with applications. This course is not available for credit to persons who have received credit in any mathematics course of a higher number with the exceptions of MA 111, 112, 123, 162, 201 and 202. Credit not available on the basis of special examination. Prereq: Two years of high school algebra and a Math ACT score of 21 or above or a Math SAT score of 510 or above; or UK 096; or appropriate MathIndex; or grade of B or better in MA 111. Math placement test recommended.*

Student learning outcomes and course goals

The goal of this course is to prepare you to use the basic tools of algebra to manipulate both known and unknown numerical quantities. By succeeding in this course, you should be prepared to study elementary calculus (as presented in MA 123) as well as being able to understand and work with mathematical models in your other course work.

Students who successfully complete this course will be able to:

1. Recognize reasonable answers based on number sense and the algebraic relations that must be satisfied by solutions.
2. Recognize and operate with covariational and functional relationships between quantities
3. Read and express those relationships as implicit equations, explicit (functional) equations, graphs, tables of values, and verbal descriptions
4. Manipulate implicit and explicit equations to solve for a chosen variable, or recast a functional relationship in terms of a chosen independent quantity.
5. Use algebraic techniques to solve applied and modelling problems in restricted settings appropriate for a general mathematics course
6. Analyze and evaluate sample arguments and solutions for correctness and reasonableness
7. Analyze limitations of models, especially in terms of piecewise functions and domain restrictions
8. Use appropriate technology to understand and solve problems

Grading

Your final grade is a letter grade A, B, C, D, or E. It is computed from several components (as indicated in the table). Each exam is taken in the evening, and has a very strict absence and cheating policy (be careful not to get a zero on the exam). Homework is completed online and requires paying a significant fee ($60 to $150) with the textbook. The instructor score will measure active, engaged, in-class participation. It may be based on pre-class online quizzes, in-class activities or quizzes, or post-class online quizzes. Once the semester is over, including the final exam, your total points can be compared against the grading cutoffs table to find the matching letter grade. Any curve will be decided after the final exam is graded, but is unlikely to be significant barring unforeseen circumstances. A typical grade distribution is 20% of students assigned an A, 25% B, 20% C, 10% D, 10% E, and an additional 15% withdrawing. Grade distributions may change from semester to semester, but this provides a rough indicator of the difficulty students as a whole have with the course. Please note that the option to retake this course will be more limited in the future.

Grading components				Grading cutoffs		
Points	**%**	**Assessment**		**Minimum points**	**Minimum Percent**	**Grade**
100	20%	Exam 1				
100	20%	Exam 2		459	90.0%	A
100	20%	Exam 3		408	80.0%	B
100	20%	Final Exam		357	70.0%	C
50	10%	Online Homework		306	60.0%	D
50	10%	Instructor Score		0	0.0%	E
10	2%	Written Project				
510	100%	Total				

Mid-term grades will be posted in myUK by the deadline established in the Academic Calendar.

Required course materials

Textbook

The textbook *College Algebra*, by Thomas W. Hungerford and Douglas J. Shaw is required. You may use the 4th or 5th edition of the book, but please keep in mind the requirement to have an access code for WebAssign (an additional $65 if not purchased with a 5th edition book, but it can be called *Contemporary Precalculus* by Hungerford and Shaw).

We use a customized ($50 cheaper) version of the original book, which is specifically published for the University of Kentucky and can be purchased at any UK bookstore (about $150). There is also an ebook version ($65 from WebAssign). The original and ebook versions are called *Contemporary Precalculus*.

Access Code for WebAssign

If you purchase your textbook new at any UK bookstore, this will come bundled with the book. Otherwise you will need to purchase the access code from the homework website WebAssign for about $65. You can use WebAssign free until Wednesday, August 30 by logging into Canvas. It appears that Safari on a Mac computer cannot login. We recommend using Google Chrome. Once you purchase the access code, login as usual through Canvas and it will complete the registration.

Clicker

Your instructor score is based on active, in-class participation. The way this is measured depends on which section you are in. You may want to see the submission guidelines for some details.

In the large sections, 001-014, you will need a "Reef Technologies iClicker subscription" for $15 per semester. They can be purchased from the UK bookstore, or directly from the phone app. If you don't have a device to view webpages on during class, then ask your instructor about other options. You'll need to register them on Canvas.

Students in the small sections, 015-022, do not need an iClicker. You may be asked to purchase 3x5 index cards (a dollar or two for the semester).

Lecture Notes

We will be using notes written for you as a complement/guide to the textbook in order to assist you throughout the course. We will also be using practice problems at the end of every set of notes that have been designed to

get you practicing during lecture. These are available for free on our website (though you'd have to pay for printing if you wanted paper versions).

Lecture notes and worksheets			
Textbook	**Lecture Notes**	**Worksheet**	**Slides**
Section 1.1	A bit of review (handwritten) (typeset)	worksheet (answers)	slides
Sections 1.1, 1.2, 5.1A	Solving equations wisely (handwritten) (typeset)	worksheet (answers)	slides
Sections 1.3, 1.4	The Cartesian coordinate system (handwritten) (typeset)	worksheet (answers)	
Sections 11.1, 11.1A	Systems of equations (handwritten) (typeset)	worksheet (answers)	slides
Sections 2.1, 2.2	Using technology wisely (handwritten) (typeset)	worksheet (answers)	slides
Section 2.3	A strategy for solving application problems (handwritten) (typeset)	worksheet (answers)	slides
Section 4.6	Inequalities (handwritten) (typeset)	worksheet (answers)	slides
Chapter 3	Functions (handwritten) (typeset)	worksheet (answers)	slides
Chapter 5	Exponential and logarithmic functions	worksheet	slides
Sections 4.1 to 4.4	Polynomial functions	worksheet	slides
Section 4.5	Rational functions	worksheet	slides

Calculator

For part of the course you will need a graphing calculator. A standard choice is the TI-84 ($75 to $125). Most graphing calculators have the same basic functions, and you should be able to learn about your calculator by reading the manual.

Using the calculator during a test for any reason other than performing the required calculations (for example, to recall a previously stored formula) will be considered cheating. You may use any graphing calculator that is allowed by ACT. Note that you will not be allowed to use the calculator on a cell phone, or any other communication device. Furthermore, you may not use any calculator that has a computer algebra system (CAS) or a QWERTY keyboard. In particular, you may not use the TI-Nspire CAS, any TI-89, any TI-92, the HP 48GII, any HP 40G, any HP 49G, any HP 50G, the Casio Algebra fx 2.0, the Casio ClassPad 300, the Casio ClassPad 330, or any Casio CFX-9970G.

Course policies

There are a number of important policies that can have a dramatic effect on your understanding and final grade in this course. These policies are intended to be uniform and simple, but if you have not read over them, they may have unexpected consequences.

Important dates

See the Academic Calendar, the Common Hour Exam schedule, and the Final Exam schedule for Fall 2017.

Wednesday, August 23	First Day of Classes
Tuesday, August 29	Last Day to Add
Monday, September 4	Labor Day (no classes)
Wednesday, September 13	Last Day to Drop
Wednesday, September 20	Exam 1 (7:30pm – 9:30pm)
Wednesday, October 18	Exam 2 (7:30pm – 9:30pm)
Friday, October 20	Midterm grades
Friday, November 10	Last Day to Withdraw
Wednesday, November 15	Exam 3 (7:30pm – 9:30pm)

Wednesday, November 22 to Friday, November 24	Thanksgiving Break (no classes)
Friday, December 8	Last Day of Classes
Thursday, December 14	Final Exam (6:00pm - 8:00pm)

Attendance

Active, engaged, in-class participation is mandatory and forms a major portion of your final grade. You should be ready to work when class begins (for example: seated, notes and pencil ready, attention to the front, quiet at 8:00am if the class starts at 8:00am). You should not pack up or leave until class is over (for example: you should still be working at 8:49am if the class ends at 8:50am). If you have special circumstances, please contact your instructor before class begins so that they can excuse late arrivals or early departures. Unexcused late arrivals or early departures may result in significant reduction in participation grade for each day on which they occur.

An absence can only be excused if the instructor is notified within a week of the absence. The choice to excuse the absence is with the instructor, though excuses will be granted (given timely notification) according to [University Senate Rule 5.2.4.2](): namely (a) serious illness, (b) illness or death of a family member, (c) University related trips, (d) major religious holidays, (e) other reasons deemed reasonable by the instructor. In the case of (c) and (d) notification must be provided one week in advance. In all cases documentation may be requested to ensure the absence does meet policy. For (a) a University Health Services Tier 2 or Tier 3 excuse is required, or a similar note from a health care provider who will confirm that you are a patient and were seen on the indicated day. Documentation that cannot be verified may result in the absence not being excused.

Absences can affect three major types of grade, and the policies for how absences affect each grade differ: **Homework** extensions should be requested before the homework solutions are available. Homework is available many weeks in advance, so that absences of type (c) and (d) can usually be handled without recourse to a homework extension. **Instructor score** measures a continued commitment to engaged, active in-class participation, but also recognizes that with other a thousand students there may be a number of exceptional events. Unless your instructor announces otherwise (through canvas), the following policy applies: if the number of instructor score absence excuses requested by a student is 5 or fewer, then no documentation need be given (you may still want to send a simple email stating that you will be or were absent, but you do not need to expect a reply). If the number of absence excuses requested is 6 or more, then the standard policy regarding documentation applies (though the documentation shall be due one week after it is requested). In particular, keep documentation for excused absences, especially regarding chronic conditions of type (a) or (b). Absences for **exams** are quite serious. An unexcused exam absence results in 0 for the exam grade, which lowers your final grade by at least a letter grade. To allow for exceptional circumstances, there is a simple alternate exam sign-up available in your canvas course. We have a number of alternate times available to take each exam, and any request received before one week prior to the exam for one of those times will be automatically granted (excused). On the other hand last minute requests or requests that would require undue hardship are likely to be rejected (unexcused). Absences of type (a) and (b) should be reported within 24 hours of the exam to ensure that a reasonable accommodation can be found. Exam absences not reported within a week are automatically unexcused and result in a zero on the exam.

Students are expected to withdraw from the class if more than 20% of the classes scheduled for the semester are missed (excused) per University policy. University Senate Rule 5.2.4.2 states:

> *If a student has excused absences in excess of one-fifth of the class contact hours for that course (participation activities for an online course, as defined in 5.2.4.1 A), the student shall have the right to receive a 'W', or the Instructor of Record may award an 'I' for the course if the student declines to receive a 'W'.*

Submission of assignments

Homework must be submitted online at WebAssign, in the appropriate course as accessed from [Canvas](). WebAssign is a for-profit company that charges a fee to use their online homework. The student is responsible for paying this fee. The textbook at the UK Bookstore includes this fee (about $150 including both book and fee). The WebAssign website should also provide a link to purchase an online-only version of the textbook that also includes this fee (about $65 including both e-book and fee).

The homework due dates are listed in the [course schedule](). Homework assignments are always due at 11:59 pm. Please note that if you are having trouble with the website, you should contact WebAssign for [help](). There will be many homework sets throughout the semester. You can see the homework assignment due dates on the class schedule. Note that two of these assignments are due during Dead Week.

Exams must be taken at the specified times and locations, or an alternate exam must be approved by the instructor, using the form in canvas. You are expected to take the exam without notes, textbooks, online access, or communication with your peers. You may use a calculator approved for use on the ACT.

Instructor score may require submission of online quizzes (also on WebAssign) that may be due before class ("reading checks"), during class ("emporium style"), or after class ("daily quiz"). Sections 001 to 014 require the use of Reef Technologies iClicker which costss about $15 (and can be used on your smart phone, tablet, or laptop). Instructor score may also require taking a short in-class quiz at the beginning ("entrance slip"), middle ("pop quiz"), or end ("exit slip"). You may be expected to bring your own index card to turn in the quiz, especially in sections 015 to 022.

Written projects will be submitted through CANVAS (instructions will be posted on CANVAS). The due date is Monday, November 28, 2017. This project is a mandatory part of the class and fulfills Gen Ed requirements (UK Core [Quantitative Foundations]()). Information about the project can be found [here](). This project is worth 10 points in the calculation of your final grade.

Accommodations Due to Disability

If you have a documented disability that requires academic accommodations, please see me as soon as possible during scheduled office hours. In order to receive accommodations in this course, you must provide me with a Letter of Accommodation from the Disability Resource Center (DRC). The DRC coordinates campus disability services available to students with disabilities. It is located on the corner of Rose Street and Huguelet Drive in the Multidisciplinary Science Building, Suite 407. You can reach them via phone at (859) 257-2754 and via email at drc@uky.edu. Their web address is [http://www.uky.edu/StudentAffairs/DisabilityResourceCenter/]().

Academic Honesty

All assignments, exams, quizzes, projects, and exercises completed by students for this class should be the product of the personal efforts of the individual(s) whose name(s) appear on the corresponding assignment. Cheating or plagiarism is a serious offense and will not be tolerated. Any potential cheating case will be thoroughly investigated, and could lead to failure in the course or even to expulsion from the university. See Student Rights and Responsibilities in the [University Senate Rules (Sections 6.3.1 and 6.3.2)]() for information on cheating, plagiarism, and penalties. A summary of recent changes to rules on cheating can be found at the [academic ombud website.]()

Classroom Behavior, Decorum, and Civility

Students are expected to be actively participating during class. Students are also expected not to distract others. If you arrive late, leave early, are distracted by your phone, or are otherwise not actively engaged with the class you may not receive credit for participating that day. If you are disrupting class, you may be asked to leave.

College Algebra is traditionally a very difficult class, and many of your classmates will be having a hard time adjusting both to the university and to the demands of the class. You are expected to treat your classmates with respect. It is reasonable to disagree, but you should express your disagreement respectfully. Personal attacks or statements denigrating another on the basis of race, sex, religion, sexual orientation, gender or gender expression, age, national/regional origin or other such irrelevant factors are considered a severe disruption. Harassment will not be tolerated.

Non-Discrimination Statement and Title IX Information

The University of Kentucky faculty are committed to supporting students and upholding the University's non-discrimination policy.

Discrimination is prohibited at UK. If you experience an incident of discrimination we encourage you to report it to Institutional Equity & Equal Opportunity (IEEO) Office, 13 Main Building, (859) 257-8927.

Acts of Sex- and Gender-Based Discrimination or Interpersonal Violence: If you experience an incident of sex- or gender-based discrimination or interpersonal violence, we encourage you to report it. While you may talk to a faculty member or TA/RA/GA, understand that as a "Responsible Employee" of the University these individuals MUST report any acts of violence (including verbal bullying and sexual harassment) to the University's Title IX Coordinator in the IEEO Office. If you would like to speak with someone who may be able to afford you confidentiality, the Violence Intervention and Prevention (VIP) program (Frazee Hall – Lower Level), the Counseling Center (106 Frazee Hall), and University Health Services are confidential resources on campus.

Dead week

Homework score and instructor score continue as usual. Homework is due and the typical measures of in-class participation will be present. No papers or exams will be given during dead week.

Limited course repeats

University Senate rule 4.3.3 allows department chairs to prevent a student from registering in a course for a third time, unless a student has withdrawn for urgent, non-academic reasons. Beginning in Fall 2016, the Department of Mathematics will begin enforcing this rule for students attempting a fourth registration in MA 109, 110, 113 and 137.

Course Schedule

The following is a tentative course schedule. The homework assignments correspond to the lecture notes.

Mon	Tue	Wed	Thu	Fri
Aug 21	Aug 22	Aug 23 First Day of Classes	Aug 24	Aug 25 HW: Check-in
Aug 28	Aug 29 Last Day to Add HW: A bit of review	Aug 30	Aug 31	Sep 1 HW: Solving Equations A
Sep 4 Labor Day (no classes)	Sep 5 HW: Solving Equations B	Sep 6 HW: Mini-Exam 1	Sep 7	Sep 8 HW: Solving Equations C
Sep 11	Sep 12 HW: Solving Equations D	Sep 13 Last Day to Drop	Sep 14	Sep 15 HW: Cartesian coordinates A

Sep 18	Sep 19 HW: Cartesian coordinates B	Sep 20 Exam 1 (7:30pm – 9:30pm)	Sep 21	Sep 22
Sep 25	Sep 26 HW: Systems A	Sep 27	Sep 28	Sep 29 HW: Systems B
Oct 2	Oct 3 HW: Systems C	Oct 4 HW: Mini-Exam 2	Oct 5	Oct 6 HW: Tech Wisely
Oct 9	Oct 10 HW: Applied	Oct 11	Oct 12	Oct 13 HW: Inequalities
Oct 16	Oct 17 HW: Functions A	Oct 18 Exam 2 (7:30pm – 9:30pm)	Oct 19	Oct 20 Midterm grades
Oct 23	Oct 24 HW: Functions B	Oct 25	Oct 26	Oct 27 HW: Functions C
Oct 30	Oct 31 HW: Functions D	Nov 1 HW: Mini-Exam 3	Nov 2	Nov 3 HW: Functions E
Nov 6	Nov 7 HW: Functions F	Nov 8	Nov 9	Nov 10 Last Day to Withdraw HW: Exp/Log A
Nov 13	Nov 14 HW: Exp/Log B	Nov 15 Exam 3 (7:30pm – 9:30pm)	Nov 16	Nov 17
Nov 20 HW: Written Project	Nov 21 HW: Exp/Log C	Nov 22 Thanksgiving Break (no classes)	Nov 23 Thanksgiving Break (no classes)	Nov 24 Thanksgiving Break (no classes)
Nov 27	Nov 28 HW: Poly A	Nov 29 HW: Mini-Exam 4	Nov 30	Dec 1 HW: Poly B
Dec 4	Dec 5 HW: Poly C	Dec 6	Dec 7	Dec 8 Last Day of Classes HW: Rational
Dec 11	Dec 12	Dec 13	Dec 14 Final Exam (6:00pm - 8:00pm)	Dec 15

Study help

In addition to the [lecture notes](), the [textbook]() and your [instructor's office hours](), you may find the following useful for studying:

Old exams

The topics covered on each exam in MA 109 may change slightly from semester to semester. Thus, the exams which are linked to this page may cover different topics than the exams to be given this semester in MA 109.

Spring 2016	[Exam 1]() [Key 1]()	[Exam 2]() [Key 2]()	[Exam 3]() [Key 3]()	[Exam 4]() [Key 4]()
Fall 2015	[Exam 1]()	[Exam 2]()	[Exam 3]()	[Exam 4]()

	Key 1	Key 2	Key 3	Key 4
	Explanation 1	Explanation 2	Explanation 3	Explanation 4 (and another)
Spring 2015	*Exam 1*	Exam 2	Exam 3	Exam 4
	Key 1	Key 2	Key 3	Key 4
Fall 2014	Exam 1	Exam 2	Exam 3	Exam 4
	Key 1	Key 2	Key 3	Key 4
Spring 2014	Exam 1	Exam 2	Exam 3	Exam 4
	Key 1	Key 2	Key 3	Key 4
Fall 2013	Exam 1	Exam 2	Exam 3	Exam 4
	Key 1	Key 2	Key 3	Key 4
Spring 2013	Exam 1	Exam 2	Exam 3	Exam 4
	Key 1	Key 2	Key 3	Key 4
Fall 2012	Exam 1	Exam 2	Exam 3	Exam 4
	Key 1	Key 2	Key 3	Key 4
Spring 2012	Exam 1	Exam 2	Exam 3	Exam 4
	Key 1	Key 2	Key 3	Key 4
Fall 2011	Exam 1	Exam 2	Exam 3	Exam 4
	Key 1	Key 2	Key 3	Key 4
Spring 2011	Exam 1	Exam 2	Exam 3	Exam 4
	Key 1	Key 2	Key 3	Key 4

Services in The Mathskeller and The Study

The Mathskeller is located in CB 063 in the basement of the classroom building. Many instructors from the Department of Mathematics will hold office hours in the Mathskeller. In addition, limited drop-in tutoring is available. The Mathskeller is open from 9am to 5pm Monday through Friday (except academic holidays) during the semester. Additional information is available at http://www.math.uky.edu/~mathskeller/.

The Peer Tutoring Program offers FREE drop-in tutoring for many University of Kentucky (UK) core courses. Offering proactive assistance, the goal of the Peer Tutoring Program is to enhance students' academic experience as early and as often as possible. The Peer Tutoring Program provides a welcoming and friendly atmosphere for students to drop in, as they wish, to seek help on homework or exam prep, or simply to study within a group environment. Peer Tutors in The Study and The Study North are nationally certified, well-trained undergraduate students who have successfully completed the course for which they tutor at UK. This makes them a great resource for questions about a professor or course format in addition to questions pertaining to the subject

Peer tutoring is offered in two locations—The Study, on the third floor of the Complex Commons building in the Blanding-Kirwan Complex on south campus, and The Study North, on the first floor of Champions Court I/Jewel Hall (residence hall across from the Student Center) on north campus.

Written Project for MA109

A lab technician reports to you the following measurements of the diameter of a circular colony of fungus:

Time (in minutes):	0	5	10	15	30	45	60	75	90	105	120	180	240	300	360
Diameter (in mm):	.07440	0.5741	1.086	1.576	3.016	4.527	6.018	7.531	9.017	10.56	12.00	16.06	22.06	28.08	34.05

Part 1: Setting up the model.

Demonstrate your ability to model this situation using algebraic language. Give a formula for the area of the colony in terms of the diameter. Explain how function composition allows you to give a formula for the area in terms of time and give that formula in a clearly displayed equation.

To help communicate the ideas clearly to a wide audience, you must provide at least one additional example of the same mathematical phenomenon described here in the example of fungal growth. It is preferable if this additional example is related to your own subject area and it should be drawn from everyday life.

Part 2: Investigating the data.

Compare the average rate of change of the area during the first hour (0 minutes to 60 minutes) with the average rate of change in the fifth hour (240 minutes to 300 minutes). Notice how the average rate of change has itself changed substantially. You will need to make judgements and draw conclusions from investigations such as this, so be sure to explain this part clearly.

Part 3: Interpretation and evaluation of relevancy of data.

When the lab technician is asked about the substantial change, they look embarrassed and admit that "an anomalous event occurred around two and half hours into the experiment, but everything was fixed by the third hour."

Explain how the data supports the idea that an anomalous event took place. Give specific reasons backed up by *quantitative evidence.*

Does the data support the claim that the anomalous event is the *primary cause* of the change in the average rate of change? Give specific reasons backed up by numbers.

You will be graded both on the soundness of your argument and on the clarity with which it is expressed. Be sure to address which data is relevant to the argument.