# MATH 111 Mathematical Models for the Management Sciences
# Fall 2020

**Instructor:**   Roger Reakes                                     **Office:**   My Home
**Phone:**   375-2450                                             **Email:**   reakes@roanoke.edu

**Office Hours:**   Flexible office hours will be available for Zoom meeting office appointments.  I will do my very best to accommodate your schedule.  To set up an appointment send me an email to request an appointment which includes times you are available.  I will send a Zoom meeting invitation based on your availability.

**Text:**   *Mathematical Applications for the Management, Life, and Social Sciences, (10th edition),* by Ronald Harshbarger and James J. Reynolds.

**Required Materials:**   All students need access to a computer and WiFi for as as many hours as necessary to complete course requirements.  The lack of an internet connection due to vacations, jobs and activities are not an excuse for work not being completed.

**Note:**   This course may not be taken for credit if credit has been received for Mathematics 112 or higher.  If you have questions concerning this, please contact your advisor immediately.  Also, you need to earn a C or better in this course or in INQ 240 to declare a major in Business Administration.  Once again, please contact your advisor if you have questions regarding the necessary grades/courses.

**Academic Integrity:**   You are expected to be familiar with the Academic Integrity Code outlined in the booklet, *Academic Integrity at Roanoke College*.
https://www.roanoke.edu/inside/a-z_index/academic_affairs/academic_integrity.
You are expected to do all work graded for accuracy independently.  This includes tests, quizzes, and graded practice problems.  You are allowed to work alone, with a partner or a group on the daily independent practice problems which will only be checked for completion.

**Course Objective:**   to provide the background in the quantitative techniques necessary to better understand more advanced courses in Business and Economics.

**Course Outcomes:**   Upon completing this course, the student should be able to:
1)   solve linear equations (and  applications) in one or more variables.
2)   solve systems of linear equations (and applications) by utilizing graphing, elimination, and matrix row-reduction techniques.
3)   solve quadratic functions and to utilize these functions in applications.
4)   utilize both graphical methods and Excel Solver to find the optimal value of a linear function, subject to constraints.
5)   Select the best fit line or curve function for a data set and find the regression equation.
6)   find the derivative of a function, interpret the derivative, and use the derivative for business applications.

**Policy on expected number of hours of work per week:**   Per the Academic Catalog, "For each one-unit course, students are expected to complete 12 hours of work inside and outside of class each week."  Realistically, this may vary due to the strength of the background of each individual student with respect to course content.

**Grading:**

| | |
|---|---|
| Completion of Watching Videos | 5% |
| Completion of Independent Practice Problems: | 10% |
| Graded Practice Accuracy Problems | 15% |
| Mastery Test Grade: | 70% |

**Grading cont...:**
Grades will be assigned using the scale below:

| A | 93-100 | | C | 73-76 |
|---|--------|---|---|-------|
| A- | 90-92 | | C- | 70-72 |
| B+ | 87-89 | | D+ | 67-69 |
| B | 83-86 | | D | 63-66 |
| B- | 80-82 | | D- | 60-62 |
| C+ | 77-79 | | F | Below 60 |

**Testing Policy:** We will use Mastery-Based Testing rather than Points-Based Testing. Mastery-based testing is

very different from what you are used to - do not hesitate to ask me questions!
You will only receive credit for answers that demonstrate you completely understand (have mastered) a topic. But you will get MANY chances to display mastery throughout the semester with NO PENALTY for earlier attempts.

- The course has been summarized by 16 topics.
- Your mastery of questions on these topics is assessed through the working of problems in mastery opportunity classes and during the final exam period.
- Each problem submitted is graded as either "Mastered" or "Not Mastered". A grade of Mastery indicates that you have demonstrated a full understanding of the concept being tested and further work on the topic is unnecessary.
- Once you have mastered a topic, you need not attempt it again.
- There is no penalty for multiple attempts taken to achieve mastery.
- Mastery does not mean perfect! It means you understand and can demonstrate all fundamentals of the topic and are proficient at the level desired for the course you do not need to study the topic further.
- Your overall test grade is determined by the number of topics you have mastered illustrated in the table below:

| # Mastered | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
|------------|-----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Mastery Grade | 100 | 95 | 90 | 85 | 80 | 75 | 70 | 65 | 60 | 55 | 50 | 45 | 40 | 35 | 30 | 25 |

- All students are required to attempt to master topics for the first time in class on the date listed in the course schedule.
- Retrying to master the topics after the first attempt may be done any time after the first attempt either in class on mastery opportunity days or during office hours.
  - To retry a topic in class you will request which topics you want to attempt to master using a Google Form link sent to you via email or use the link in Inquire. This request must be submitted by NOON the day prior to the mastery opportunity class.
  - To retry a topic during office hours, you must book an appointment during office hours. If my posted office hours do not work with your schedule, you may email me to set up a time that works for both of us.

**Late Work Policy:** Independent practice problems must be submitted electronically using email (reakes@roanoke.edu) the day they are due and checked for completion.
This work will only be accepted on the day it is due. No late papers will be accepted without arrangements approved prior to absence OR without written documentation from a college official. If you miss class for any reason you should email the assignment to me the day it is due!
Graded practice problems selected (usually 1 or 2) from the independent practice problems each class and checked for accuracy and may be submitted until solved correctly.
They will be accepted up to midnight the day before the final exam.

**Attendance:** Class attendance is a very important aspect of a student's success in this course. The student is

expected to attend every class and is accountable for any missed classes.

**Subject Tutoring:** Subject Tutoring is a CRLA Nationally Certified Program located on the lower level of Fintel Library in room 005. Subject Tutoring offers individual appointments in 30-minute intervals for Lab Sciences, Modern Languages, Math and CPSC, Social Sciences, Business and Economics. Hours are Sunday - Thursday 4 p.m. - 9 p.m. For a list of tutorials or to make an appointment, go to www.roanoke.edu/tutoring.

**Tentative Schedule and Assignments:**

**Use the following link:**

**Course Schedule**

**Topics:**

**Use the following link:**

**Course Topics**

| Day | Date | Topic/Video | GP | Topic Description | Independent Practice |
|-----|------|-------------|-----|-------------------|----------------------|
| Wed | 8/19 | | None | Course Introduction | Personal Introduction Email |
| | | | | Desmos Share Activity | |
| Mon | 8/24 | 1 | None | Permutations, Combinations | pp470-471/ 1,15,27,31,41,43 |
| Wed | 8/26 | 2 | GP1 | Functions | pp73-74/ 1,3,4,5,6,13 |
| | | | | Business Applications of Functions | pp112-113/ 1,9,13 |
| | | | | Piecewise Functions | pp163-164/ 49 |
| Mon | 8/31 | 3 | GP2 | Solving Linear Equations in One Variable | p62/ 9,13,19,31 Graphically & Algebraically |
| | | | | Business Applications of Linear Equations | pp113-114/ 3,17,19 Graphically & Algebraically |
| | | | | Solving Linear Inequalities in One Variable | |
| Wed | 9/2 | 4 | GP3 | Writing Linear functions , Graphing lines | pp85-87/ 9,10,13,17,19,21,23,29,35,37,64 Confirm Algebra Answers Graphically |
| | | | | Business Applications of Linear Functions | pp112-113/ 5,7  Confirm Algebra Answers Graphically |
| Mon | 9/7 | 5 | GP4 | Scatter Plots, Correlation & Linear Regression | pp171-172/ 9,10,25,26 |
| Wed | 9/9 | | None | Required Mastery Opportunity for Topics 1-4 | |
| Mon | 9/14 | 6 | GP5 | Solutions of systems of linear equations Graphically & Algebraically | p104/ 9,10,13,19,23 Graphically & Algebraically |
| | | | | Business Applications of Systems of  Equations | p115/ 45,47 Graphically & Algebraically |
| | | 7 | | Scatter Plots, Correlation & Quadratic Regression | pp171-172/ 11,12,28a,31a |
| Wed | 9/16 | 8 | GP6&7 | Quadratic Functions: Graphing & Properties of Parabolas | pp143-145/ 3,5,31,33  Confirm Algebra Answers Graphically |
| | | | | Business Applications of Graphs & Properties of Quadratic Functions | pp151-152/ 7,9,11  Confirm Algebra Answers Graphically |
| Mon | 9/21 | 9 | GP8 | Solving Quadratic Equations | p134/ 5,7,11,13b,15b,25,41,45,47 Graphically & Algebraically |
| | | | | Business Applications of Solving Quadratic Equations | pp151-152/ 3,5 Graphically & Algebraically |
| Wed | 9/23 | | None | Required Mastery Opportunity for Topics 5-8 | |
| | | | | Mastery Redo Opportunity for Topics 1-4 | |
| Mon | 9/28 | 10 | GP9 | Business Applications of Quadratic Systems | pp152-153/ 23,25,27,29,31  Graphically & Algebraically |
| | | | | | |
| Wed | 9/30 | 11 | GP10 | Polynomial, Rational, Power, & Exponential Functions | pp162-164/ 13,43 p336/ 29 (Graph them also!) |
| | | | | Using Correlation to Find and graph the Best Fit Curve | pp171-173/ 1-8 all, 32-35 all |
| Mon | 10/5 | 12.1 | GP11 | Solving 3 by 3 Systems Algebraically & Graphically | p104/ 31,33,34 p236/ 57a p252/ 56a   Graphically & Algebraically |
| Wed | 10/7 | | None | Required Mastery Opportunity for Topics 9-11 | |

| | | | | Mastery Redo Opportunity for Topics 1-8 | |
|---|---|---|---|---|---|
| Mon | 10/12 | 12.2 | GP12.1 | Matrices | p194/ 15,17,19,25,27 |
| | | | | Multiplication of Matrices | pp206-207/ 3-13 odd |
| | | | | Inverses of Matices | p234/ 5,7,15,17 |
| Wed | 10/14 | 12.3 | GP12.2 | Using Matrix Matrix Equation to Solve Linear System | p104/ 31,33,34 p236/ 57a p252/ 56a |
| | | | | Using Gauss Jordan Elimination (Rref on TI83/84) | Solve all questions using a matrix equation AND an augmented matix. |
| Mon | 10/19 | 13.1 | GP12.3 | Linear Programming: Graphical Methods | pp275-277/ 1,3,15,17 25,27 |
| | | 13.2 | | Linear Programming: Using Excel | Shared Excel File IP1, IP2, IP3, IP4 |
| Wed | 10/21 | | None | Required Mastery Opportunity for Topic 12 | |
| | | | | Mastery Redo Opportunity for Topics 1-11 | |
| Mon | 10/26 | 14.1 | GP13.1&13.2 | Limits and Continuous Functions: Graphs & Tables | pp553-554/ 1,3,7,9,11,13 |
| | | 14.2 | | Limits and Continuous Functions: Algebraically | pp 553-554/ 17,21,23,25,31,41 |
| Wed | 10/28 | 14.3 | GP14.2&14.3 | The Derivative with Limits | 577-578/ 1a,2a,12,13 |
| | | 15.1 | | The Derivative with Formulas | pp588-589/ 3,7,9,15,21,25,47 |
| | | | | Business Applications of the Derivative | pp624-625/ 3,17,27 |
| Mon | 11/2 | 15.2 | GP14.3&15.1 | The Product Rule and the Quotient Rule | pp596-597/ 3,7,11,17,39,41,43 |
| | | | | The Chain Rule | pp603-604/ 5,7,17,39,41,47 |
| Wed | 11/4 | | None | Required Mastery Opportunity for Topics 13 &14 | |
| | | | | Mastery Redo Opportunity for Topics 1-12 | |
| Mon | 11/9 | 15.3 | GP15.2 | Using Derivative Formulas Together | pp610-611/ 13,15,17,37,41,43 |
| | | 16.1 | | Higher order Derivatives | pp615-616/ 1,3,7,11,17 |
| Wed | 11/11 | 16.2 | GP15.3&16.1 | Relative Maxima and Minima | pp647-649/ 1,5,7,51,53 |
| | | 16.3 | | Concavity and Points of Inflection | pp660-662/ 23a,23b,35,39 |
| Mon | 11/16 | | GP16.2&16.2 | Course Evaluations | |
| | | | | Required Mastery Opportunity for Topics 15 & 16 | |
| | | | | Mastery Redo Opportunity for Topics 1-14 | |
| Fri | 11/20 | | | Final Exam (Mastery Redo Opportunity Topics 1-16) | 1:00 pm to 5:00pm |
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