

### Instructor

Randy Scott  
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### Office Hours

T 1000-1230  
Th 1000-1230

### Prerequisite

Math 185, or equivalent, with a grade of C or better.

### Attendance

Attendance and participation at all Zoom meetings is required.

Be in class (Zoom), on time, each and every day. Attendance comprises a small part of your course grade and missing class will adversely affect your course grade. From the 2020-2021 SCC Catalog: "A student may be dropped for excessive absences when the total hours of absence exceed 10% of the total scheduled hours of class."

For Spring 2021, this means I will drop you for excessive absence if you miss more than 3 class (Zoom) meetings.

### Withdrawals

If you decide to drop this class, it is *your responsibility* to follow the correct procedures. The last day to drop this class with no record of participation and to receive a refund is February 21, 2021. The last day to drop this class with a W grade is May 9, 2021. Again, it is *your responsibility* to be aware of and to follow the correct procedures.

### Behavioral Expectations

Your cell phone is to be turned off at the beginning of each class meeting and to remain turned off for the duration of the class meeting. You are free to turn it on at any time after class has concluded.

**RSCCD Standards of Student Conduct** All students are responsible for maintaining appropriate conduct while enrolled in classes through the Rancho Santiago Canyon College District (RSCCD). Guidelines for student conduct are set forth in the RSCCD Standards of Student Conduct policy. Detailed RSCCD information (board policy) regarding student discipline and rights within this policy is available in the college catalog and BP 5500:

<https://rsccd.edu/Trustees/Pages/policies-and-regulations.aspx>

Based upon the RSCCD Standards of Student Conduct (also known as the Code of Conduct) all students will be in violation of the code should you become disruptive in any way, such that you disrupt the teaching of this class. This includes excessive talking with your peers and cell phone usage, which is inclusive of texting. Students who violate the Standards of Conduct are subject to disciplinary action that includes, but is not limited to, removal from class, suspension and expulsion.

**RSCCD Title IX Statement** Rancho Santiago Community College District is committed to providing a safe and nondiscriminatory campus. The district takes all allegations of sexual misconduct seriously and encourages all individuals to report misconduct to any District employee that the Complainant trusts and feels comfortable with. Under Title IX, the District is required to take immediate and corrective action

if a responsible employee knew or, in the exercise of reasonable care, should have known about sexual or gender-based harassment that creates a hostile environment. These actions include: Stopping the conduct Preventing its re-occurrence Remediating its effects Providing care and support for the reporting person Taking steps to insure the safety and security of our community

The District considers all employees responsible employees (with the exception of Psychologists at the Student Health Center) and as such, they are required to share a report of misconduct with the Title IX Coordinator or a member of the Title IX team. The Title IX team, under the guidance of the Title IX Coordinator, will conduct an initial assessment of the conduct, the Complainants expressed preferences, if any, as to course of action, and the necessity for any interim remedies or accommodations to protect the safety of the Complainant or the community. If a student does not wish to report an incident to a responsible employee but wishes to speak to someone confidentially, the student can speak to the College Psychologist. Only psychologists within the Student Health Center are required by law to maintain near or complete confidentiality. The College Psychologist is located in the Student Health & Wellness Services in T-102 or call 714-628-4773.

### **Accomodations for Disabilities**

Students with verifiable disabilities who want to request academic accommodations are responsible for notifying their instructor and Disabled Students Programs and Service (DSPS) as early as possible in the semester. To arrange for accommodations, contact DSPS at (714) 628-4860 or by TDD (714) 639-9742 or stop by the DSPS Center in E-105.

### **Academic Honesty**

Students attending Santiago Canyon College are expected to be honest and forthright in their academic endeavors. To falsify the results of research, to steal the words or ideas of another or to cheat on an examination, corrupts the essential process by which knowledge is advanced. Academic dishonesty is seen as an intentional act of fraud, in which a student seeks to claim credit for the work or efforts of another without authorization, or uses unauthorized material or fabricated information in any academic exercise. We, as an institution, also consider academic dishonesty to include forgery of academic documents, intentionally impeding or damaging the academic work of others, assisting other students in acts of dishonesty or coercing students into acts of dishonesty.

In matters relating to academic honesty violations, the primary responsibility for disciplinary proceedings rests with the instructor and the academic division where the violation allegedly occurred.

### **Math Success Center (nee: MaSH) Registration**

The Math Success Center (a.k.a. MSC) is a FREE service provided by SCC that provides students with supplemental learning to the classroom. A math faculty member, Instructional Assistants and student tutors are always on duty to assist students with questions or concerns from their math class. Due to COVID-19, the MSC is will be offered remotely via Canvas for Spring 2021. The hours of operation for Spring 2021 are

#### **Spring 2021**

**Monday through Thursday: 9:30 a.m.-7:30 p.m. (0930-1930)**

**Saturday 9 a.m.-3 p.m. (0900-1500)**

To utilize the MSC, you must enroll in MATHCE 100. Once enrolled, you can access two types of assistance, discussion boards and live help.

- Discussion Boards: Once in the MATHCE 100 Canvas page, students can post questions to a discussion board at any time. Please follow the directions for posting and a staff member will reply within 24 business hours.
- Live Help: Offered only during the hours of operation. Once in the MATHCE 100 Canvas page, click the “Get Help Now” button on the homepage. Scroll through the MSC staff members. Any staff members on duty will display a green “online” icon. On that staff member’s card, click “Ask for help”

and you will be able to start a conversation with that staff member. During live help, staff members have chat options and can also utilize an interactive whiteboard to assist you.

The MSC is a Pass/No Pass, Open Entry/Open Exit noncredit course. You will need to complete at least 10 hours and one activity in the MSC within the 8-week semester to earn a grade of Pass (P). When you log into Canvas and are in the MSC course (MATHCE 100), your hours are automatically being logged. At the end of the semester we will use the Canvas log to assign grades. A Pass (P) will be assigned to any student who completes at least 10 hours on Canvas, plus completes one assignment in Canvas. A Satisfactory Progress (SP) will be assigned to any student who completes any number of hours in the MSC (via Canvas). If you do not complete any hours in the MSC (via Canvas) you will be dropped from the course at the end of the semester and it will not show on your transcript. If you have any questions or concerns, please email the MSC at [sccmathstudyhall@scccollege.edu](mailto:sccmathstudyhall@scccollege.edu)

### Calculator/Technology Use

We will use a variety of technologies during the semester. Since the course is presented in the RemoteLIVE! format, you will have to have access to the course Canvas site and through that site to Zoom. We will also be incorporating SageMath, a Computer Algebra System (CAS) that you can access through your computer or smartphone. You will probably want a graphing calculator for this course. Any brand of calculator is fine; I expect you to be able to demonstrate your understanding of the concepts and principles independent of any particular piece of technology. We will discuss appropriate use of technology during class.

### Exams

Exams are *tentatively* scheduled for Tuesday, March 23 and Tuesday, May 11, 2021. I reserve the right to change the date to reflect the progress we make in the class, but I promise to always give you at least a one week notice before an exam.

Completed exams will receive 50% credit if submitted less than *one hour* after the due date/time and 0% credit if submitted more than *one hour* after the due date/time.

### Quizzes

A short quiz will be given as indicated on the schedule. Some quizzes will be at the beginning of the class time, some in the middle, and some at the end of the class time.

Completed quizzes will receive 50% credit if submitted less than *one hour* after the due date/time and 0% credit if submitted more than *one hour* after the due date/time.

I will drop your lowest quiz score at the end of the semester.

### Homework

Doing work outside of class time provides the essential practice needed for success in mathematics. Plan to spend at least *three* hours outside of class for each hour in class. These *three* hours may include reviewing your class notes, reading the textbook, working on the assigned problems, or reviewing older homework assignments.

Regularly check your class calendar to stay current on homework assignments and submissions through Canvas.

Completed assignments will receive 50% credit if submitted less than *one week* after the due date/time and 0% credit if submitted more than *one week* after the due date/time.

### Final Exam

A comprehensive final exam will be administered during the last two regularly scheduled class meetings: Tuesday, June 1, and Thursday, June 3, 2021.

## Grades

Your grade in this class is computed using a weighted average with the following category weights and letter grade assignments with  $p$  being your class percentage and  $l$  being the letter grade:

<b>Exams</b> 50%	If $p \geq 90$ , then	$l = A$
<b>Quizzes</b> 15%	If $80 \leq p < 90$ , then	$l = B$
<b>Homework</b> 10%	If $70 \leq p < 80$ , then	$l = C$
<b>Attendance</b> 5%	If $60 \leq p < 70$ , then	$l = D$
<b>Final Exam</b> 20%	If $\leq p < 60$ , then	$l = F$

For example, to find your exam category score, compute the average (arithmetic mean) of the percentage of each of your exam scores. To find your quizzes category score, compute the average (arithmetic mean) of the percentage of each of your quiz scores. Sum the products of all the category scores and the weight, and the result is your class percentage.

## Some Thoughts

I believe that each and everyone of you can be successful with mathematics. I believe that being able to understand and communicate mathematics is of critical importance for you, your children, and all the future generations of your family. If you work hard and maintain a positive, productive attitude, you will gain an understanding of mathematics and rational thought that will insure your success for many years to come.

## Student Learning Outcomes

**Department SLOs:** Upon completion of any course in Mathematics the student will be able to

1. Create mathematical models of real world phenomena, apply those models to make predictions about the behavior of the phenomena, apply appropriate problem solving techniques, and critically evaluate the veracity of the obtained results.
2. Clearly communicate mathematical reasoning and problem solving skills using a variety of formats, diverse technologies, and appropriate mathematical vocabulary and notation.
3. Integrate into educational and professional conduct a calm, confident, and ethical approach to mathematical reasoning and problem solving while taking personal responsibility for mathematical successes

**Course SLOs:** Upon successful completion of this course the student will be able to

1. Identify differential equations by order, linearity, homogeneity, type of coefficient, etc., and choose an appropriate solution technique based on the classification.
2. Solve a variety of differential equations and systems of differential equations using geometric, numerical, analytic, and technological approaches.
3. Build differential equations to model real-world phenomena beginning with basic scientific principles.

**Santiago Canyon College, Spring 2021, Mr. Scott**

**Math 295, Differential Equations**

**Text: *The Ordinary Differential Equations Project*, Judson**

### Ch. 1 A First Look at Differential Equations

Section	Assignment
1.1 Modeling with Differential Equations	Activity 1.1.1 a-e; Activity 1.1.2 a-d; 1.1.8 #3, 6, 11, 14, 16, 19, 23, 25, 29
1.2 Separable Differential Equations	Activity 1.2.1 a-e, use Sage to check; Activity 1.2.2 a-c; Activity 1.2.3 a-d; 1.2.8 #3, 7, 8, 13, 17, 18, 21 Do any two of 13, 17, or 18 with Sage, 22, 23
1.3 Geometrical and Quantitative Analysis	Activity 1.3.1 a-e, use Sage; Activity 1.3.2 a-d; 1.3.7 #3, 5, 7 (#3,5 with Sage) 10, 12, 13, 15 Sage, 17 Sage, 22, 23; 1.3.8 Sage Exercise #1
1.4 Analyzing Equations Numerically	1.4.5 #2 a-d, 5 a-c, 7
1.5a First-Order Linear Equations	Activity 1.5.1 a-e; Activity 1.5.2 a b; Activity 1.5.3 a-c; 1.5.7 #3, 5, 6, 9, 10, 13, 15, 20, 21, 22, 23
1.5b Variation of Parameters; Bernoulli's Equation; Ricatti's Equation	1.5.7 #24, 25, 26, 27, handout
1.6 Existence and Uniqueness of Solutions	Activity 1.6.1 b, d, f, g; 1.6.4 #1, 2
1.7 Bifurcations	Activity 1.7.1 a-c; Activity 1.7.2 a, b; 1.7.4 # 1 b c, 2, 3
1.8 Projects for First-Order Differential Equations	

### Ch. 2 Systems of Differential Equations

Section	Assignment
2.1 Modeling with Systems	Activity 2.1.1; Activity 2.1.2; 2.1.5 #1 a-d, 2, 3
2.2 The Geometry of Systems	Activity 2.2.1; Activity 2.2.2; 2.2.7 #1, 3
2.3 Numerical Techniques for Systems	Activity 2.3.1; 2.3.6 #1, 2, 3
2.4 Solving Systems Analytically	Activity 2.4.1 a-d; 2.4.5 #1 a b, 2, 3
2.5 Projects for Systems of Differential Equations	

### Ch. 3 Linear Systems

Section	Assignment
3.1 Linear Algebra in a Nutshell	Activity 3.1.1 a-d (no Sage, no calculator); Activity 3.1.2 a-e (no Sage); 3.1.5 #1, 2, 3, 5-13 odd, 15-21 odd, 23-31 odd
3.2 Planar Systems	Activity 3.2.1 a-f; 3.2.5 # 1, 3, 5, 7, 9, 10, 12
3.3 Phase Plane Analysis of Linear Systems	Activity 3.3.1 a-d; Activity 3.3.2 a-e; 3.3.5 #1, 4, 5 (for #1 & 4), 6
3.4 Complex Eigenvalues	Activity 3.4.1 a-e; Activity 3.4.2; 3.4.5 #1, 3, 5, 7, 9
3.5 Repeated Eigenvalues	Activity 3.5.1 a-e; Activity 3.5.2 a-e; 3.5.4 #1, 3, 5, 7, 9
3.6 Changing Coordinates	Activity 3.6.1 a-e; 3.6.7 #1, 3, 5, 7, 9, 11, 13, 15
3.7 The Trace-Determinant Plane	Activity 3.7.1 a-d; Activity 3.7.2 a-e; 3.7.4 #1, 3, 5, 7, 9, 11, 13, 15
3.8 Linear Systems in Higher Dimensions	3.8.5 #1, 2, 5 a c, 6, 7
3.9 The Matrix Exponential	3.9.4 # 1, 2, 5 a d
3.10 Projects for Linear Systems	

Continued on next page

**Ch. 4 Second-Order Linear Equations**

Section	Assignment
4.1 Homogeneous Linear Equations	Activity 4.1.1 a-e; 4.1.5 (no Sage) #1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 27, 29, 30, 32; 4.1.7 #1, 2, 7, 8, 9, 10
4.2 Forcing	Activity 4.2.1 a c d; 4.2.6 #9, 13, 16, 17, 21, 24, 25, 27
4.3 Sinusoidal Forcing	Activity 4.3.1 a c d e; Activity 4.3.2 a-f; 4.3.4 #1, 3, 7, 11, 13, 17, 18, 20, 24
4.4 Forcing and Resonance	Activity 4.4.1 a b; Activity 4.4.2 a-d; 4.4.5 #1, 3, 5, 7, 9, 11, 12*, 13*
4.5 Projects for Second-Order Linear Equations	

**Ch. 5 Nonlinear Systems**

5.1 Linearization	Activity 5.1.1 a b; 5.1.4 #1, 4, 5, 7, 8
5.2 Hamiltonian Systems	Activity 5.2.1 a b; 5.2.6 #1, 3, 5, 6
5.3 More Nonlinear Mechanics	5.3.5 #1*
5.4 The Hopf Bifurcation	5.4.4 #1, 2, 4
5.5 Projects for Nonlinear Systems	5.5.5 #1*, 2*, 3*, 4*, 5*

**Ch. 6 The Laplace Transform**

Section	Assignment
6.1 The Laplace Transform	Activity 6.1.1 a-c (no Sage); Activity 6.1.2 a-e; 6.1.6 #3, 5, 9-16, 18, 21; 6.1.8 #1, 2, 3
6.2 Solving Initial Value Problems	Activity 6.2.1 a-c; Activity 6.2.2 a b; 6.2.5 #2, 4, 8, 9
6.3 Delta Functions and Forcing	6.3.4 #1, 2, 4, 5
6.4 Convolution	#1-6, 7, 9, 11, 13, 15, 18
6.5 Projects for The Laplace Transform	

**Additional Topics**

Section	Assignment
A Review of Power Series	To Be Decided (TBD)
Series Solutions about an Ordinary Point	TBD
Cauchy-Euler Equations	TBD

Useful Websites:

<http://wolframalpha.com>

<https://www.sagemath.org>

<https://sites.monroecc.edu/multivariablecalculus/>

**Math 295, #92516**  
**RemoteLIVE!**

Spring 2021, First Eight Weeks  
 Santiago Canyon College

Submissions & Quizzes <b>Due Today!</b>
Lecture Sections
Homework <small>You should be working on these problems.</small>

	Sun.	Mon.	Tuesday	Wed.	Thursday	Fri.	Sat.
February	7	8	9 Calc Review for DEs <small>Online Submissions</small> Intro.; 1.1 How Fast Does a Person Learn? Activity 1.1.1	10	11 Quiz 01: Review & 1.1 1.1 Modeling Epidemics Activity 1.1.2, 1.1.8	12	13
	14	15	16 Hw 1.1 Including the two activities 1.2 Separable Hw 1.2	17	18 Quiz 02: 1.2 1.3 Geometry Hw 1.3	19	20
March	21	22	23 Hw 1.2 <small>← Includes the three activities</small> 1.3, 1.4 Hw 1.3, 1.4	24	25 Quiz 03: 1.2, 1.3 1.4, 1.5 Hw 1.3, 1.4, 1.5	26	27
	28	1	2 Hw 1.3, 1.4 1.5, 1.6 Hw 1.5, 1.6	3	4 Quiz 04: 1.7 Hw 1.5, 1.6, 1.7	5	6
April	7	8	9 Hw 1.5, 1.6, 1.7 2.1 Hw 2.1	10	11 Quiz 05: 2.2 Hw 2.1, 2.2	12	13
	14	15	16 Hw 2.1, 2.2 2.3 Hw 2.1, 2.2	17	18 Quiz 06: Catch-up Hw 2.3	19	20
May	21	22	23 Hw 2.3 EXAM I 1.1-1.7 2.1-2.3	24	25 2.4 Hw 2.4	26	27
	28	29	30 2.4, 3.1 Hw 2.4, 3.1	31	1 Quiz 07: 3.1, 3.2 Hw 2.4, 3.1, 3.2	2	3
	4	5	6	7	8	9	10

# Math 295, #92516

## RemoteLIVE!

Spring 2021, Second Eight Weeks  
Santiago Canyon College

Submissions & Quizzes	
<b>Due Today!</b>	
Lecture Sections	
Homework	You should be working on these problems.

		Sun.	Mon.	Tuesday	Wed.	Thursday	Fri.	Sat.
A P R I L	Week 9	11	12	13 Hw 2.4, 3.1, 3.2 3.3 Hw 3.3	14	15 Quiz 08: 3.4, 3.5 Hw 3.3, 3.4, 3.5	16	17
	Week 10	18	19	20 Hw 3.3, 3.4 3.5, 3.6 Hw 3.5, 3.6	21	22 Quiz 09: 3.7 Hw 3.5, 3.6, 3.7	23	24
M A Y	Week 11	25	26	27 Hw 3.5, 3.6, 3.7 3.8 Hw 3.8	28	29 Quiz 10: 4.1 Hw 3.8, 4.1	30	1
	Week 12	2	3	4 Hw 3.8, 4.1 4.2 Hw 4.2	5	6 Quiz 11: Catch-up	7	8
	Week 13	9	10	11 Hw 4.2 Exam II 2.4, 3.1-3.8 4.1, 4.2	12	13 4.3, 4.4 Hw 4.3, 4.4	14	15
J U N E	Week 14	16	17	18 6.1 Hw 4.3, 4.4, 6.1	19	20 Quiz 12: 6.2 Hw 4.3, 4.4, 6.1, 6.2	21	22
	Week 15	23	24	25 Hw 4.3, 4.4, 6.1 Series Hw Series TBD	26	27 Quiz 14: Series Hw Series TBD	28	29
	Week 16	30	31	1 Hw 6.2 FINAL EXAM I Ch 1, 2, 3	2	3 Hw Series FINAL EXAM II Ch 4, 6 series Have a nice Summer!	4	5
		6	7	8	9	10	11	12