Course Syllabus

Math 2412 – Pre-Calculus

Catalog Description: Analytic and numerical treatment of functions, their graphs, inverse functions, polynomial functions, rational and irrational functions, exponential and logarithmic functions, trigonometric and inverse trigonometric functions, and graphical analysis of slope related to derivatives and area related to integration

Prerequisites: Math 1314 or the equivalent preparation.

Semester Credit Hours: 4
Lecture Hours per Week: 3 **Lab**
Hours per Week: 1
Extended Hours:1
Contact Hours per Semester: 80
State Approval Code: 27.0101.58 19

Class section meeting time:

Alternate Operations During Campus Closure: In the event of an emergency or announced campus closure due to a natural disaster or pandemic, it may be necessary for Panola College to move to altered operations. During this time, Panola College may opt to continue delivery of instruction through methods that include, but are not limited to: online learning management system (CANVAS), online conferencing, email messaging, and/or an alternate schedule. It is the responsibility of the student to monitor Panola College's website (www.panola.edu) for instructions about continuing courses remotely, CANVAS for each class for course-specific communication, and Panola College email for important general information.

Artificial Intelligence (AI) Course Policy:
There are situations throughout the course where you may be permitted to use artificial intelligence (AI) tools to aide in further understanding of mathematical concepts. However, AI tools may not be used for any graded assignments including but not limited to exams, quizzes, and projects. Use of any AI-generated content in this course without the instructor's consent qualifies as academic dishonesty and violates Panola College's standards of academic integrity.

Core Components and Related College Student Learning Outcomes
This course counts as part of the academic requirements of the Panola College Core Curriculum and an Associate of Arts or Associate of Science degree.   ☐ Yes ☐No: If no, skip to Instructional Goals.

The items below marked with an X reflect the state-mandated outcomes for this course **IF this is a CORE course**:

☒ Critical Thinking Skills – to include creative thinking, innovation, inquiry and analysis, evaluation and syntheses of information

  ☐ CT1: Generate and communicate ideas by combining, changing, or reapplying existing information

  ☒ CT2: Gather and assess information relevant to a question

  ☒ CT3: Analyze, evaluate, and synthesize information

☒ Communication Skills – to include effective development, interpretation, and expression of ideas

through written, oral, and visual communication

☒ CS1: Develop, interpret, and express ideas through written communication

☐ CS2: Develop, interpret, and express ideas through oral communication

☐ CS3: Develop, interpret, and express ideas through visual communication

☒ Empirical and Quantitative Skills – to include the manipulation and analysis of numerical data or observable facts resulting in informed conclusions

☒ EQS1: Manipulate and analyze numerical data and arrive at an informed conclusion

☒ EQS2: Manipulate and analyze observable facts and arrive at an informed conclusion

☐ Teamwork – to include the ability to consider different points of view and to work effectively with others to support a shared purpose or goal

☐ TW1: Integrate different viewpoints as a member of a team

☐ TW2: Work with others to support and accomplish a shared goal

☐ Personal Responsibility – to include the ability to connect choices, actions, and consequences to ethical decision-making

☐ PR1: Evaluate choices and actions and relate consequences to decision-making

☐ Social Responsibility – to include intercultural competence, knowledge of civic responsibility, and the ability to engage effectively in regional, national, and global communities

☐ SR1: Demonstrate intercultural competence

☐ SR2: Identify civic responsibility

☐ SR3: Engage in regional, national, and global communities

Instructional Goals and Purposes:
The purpose of this course is to:

1. Apply coordinate geometry formulas.

2. Model application problems using functions.

3. Model and solve variation problems.

4. Perform transformations on functions.

5. Find real and complex zeros of polynomial functions.

6. Graph rational, exponential, and logarithmic functions.

7. Model and solve problems involving exponential and logarithmic functions.

8. Model and solve trigonometry problems involving both right triangles and oblique triangles.

9. Graph trigonometric functions and their inverses.

10. Solve trigonometric identities and trigonometric equations.

11. Write a sum or difference of fractional expressions as a single fraction.

12. Model and solve problems involving conic section formulas for a circle, parabola, ellipse, and hyperbola.

13. Graph polar and parametric equations.

14. Model and solve problems involving vectors.

15. Find limits of functions numerically, algebraically, and graphically.

16. Apply the definition of a derivative.

Learning Outcomes: *[from the ACGM catalog]*
After studying all materials and resources presented in the course, the student will be able to:

1. Improve problem-solving skills through solving application problems.

2. Demonstrate at the completion of the course the algebraic manipulation and problem solving

    skills necessary to be successful in future coursework.

3. Develop the vocabulary and methodology necessary for reading and understanding scientific and

    mathematical literature.

4. Construct appropriate mathematical models to solve applications.

5. Interpret and apply mathematical concepts.

6. Use multiple approaches - physical, symbolic, and verbal - to solve application problems.

    (Panola College – none in ACGM)

Course Content:
Students in all sections of this course will learn the following content:

1. Simplify algebraic expressions, exponents and radicals.

2. Solve fractional equations and inequalities.

3. Model and solve problems involving linear equations.

4. Apply the formulas of coordinate geometry (distance, midpoint).

5. Write the equation of a circle given its center and radius.

6. Graph circles, linear functions, and inequalities.

7. Write equations of linear functions given slope, points, parallel and perpendicular lines.

8. Define a function, domain, and range.

9. Model and solve problems involving variation functions.

10. Find the average rate of change, increasing and decreasing intervals, and extreme values of

    functions.

11. Apply transformations to functions.

12. Model problems using functions.

13. Combine functions by adding, subtracting, multiplying, dividing, and composition.

14. Define one-to-one functions and find their inverses.

15. Define a polynomial function and sketch its graph using end behavior, zeros, local extrema, and test points.

16. Divide polynomials by using synthetic division.

17. Define and apply the remainder and the factor theorems.

18. Find the rational zeros of a polynomial by use of the rational zeros theorem, Descartes' rule of signs, and the upper/lower bound theorem.

19. Add, subtract, multiply, and divide complex numbers.

20. Find the complex roots of quadratic equations.

21. Apply the Fundamental Theorem of Algebra and the Complete Factorization Theorem to find the complex roots of a polynomial function.

22. Write a polynomial function give its complex and real roots.

23. Find the vertical and horizontal asymptotes of a rational function.

24. Sketch the graph of a rational function.

EXPONENTIAL AND LOGARITHMIC FUNCTIONS

25. Sketch the graph of an exponential and logarithmic function and find the domain and range.

26. Model and solve problems involving compound interest.

27. Define the natural logarithm and its properties.

28. Apply the Laws of Logarithms to simplify and solve logarithmic equations.

29. Solve exponential equations.

30. Model and solve problems involving exponential and logarithmic functions.

TRIGONOMETRIC FUNCTIONS

31. Define the unit circle and use reference numbers to find terminal points.

32. Define the trigonometric functions, their even-odd properties, their signs in different quadrants, and the domains and ranges of each.

33. Sketch the graphs of the trigonometric functions.

34. Find the period and amplitude of trigonometric functions.

35. Graph transformations of the trigonometric functions.

36. Convert between radians and degrees.

37. Model and solve problems involving the formulas for length of a circular arc, area of a sector of a circle, and linear and angular speed.

38. Model and solve problems involving trigonometry of right triangles.

39. Use reference numbers on the unit circle or reference triangles to evaluate trigonometric functions.

40. Apply the Law of Sines and the Law of Cosines to solve oblique triangle problems.

41. Prove Trigonometric Identities.

42. Apply the Addition and Subtraction Formulas to problems and identities.

43. Apply the Sum of Sines and Cosines Formulas.

44. Apply the Double-Angle and Half-Angle Formulas to problems and identities.

45. Apply the Product-to-Sum and Sum-to-Product Formulas.

46. Define and sketch the inverse trigonometric functions.

47. Solve trigonometric equations involving single and multiple angles.

VECTORS

48. Understand the geometric and the analytic description of vectors.

49. Find the magnitude, horizontal and vertical components of a vector.

50. Find the resultant force of two or more vectors.

51. Apply vectors to model and solve problems involving velocity and force.

52. Find the dot product of two vectors and use it to find the angle between the two vectors.

53. Find the component vector of u along v.

54. Find the projection of u onto v.

55. Apply vectors to solve problems involving work.

LIMITS

56. Find the limit of a function numerically, algebraically, and graphically.

57. Define a one-sided limit

58. Write the definition of a limit.

59. Apply the Limit Laws.

60. Find and prove limits by applying right- and left-hand limits.

61. Write the definition of a derivative.

62. Find the equation of a line tangent to a curve at a given point.

63. Find the instantaneous velocity of a falling object.

64. Find the limit of a function at infinity.

65. Find the horizontal asymptote of a rational function by applying limits at infinity.

66. Approximate the area under a curve.

67. Find the exact area under a curve using limits.

Extended Hours:
For each concept course content listed about, 30 minutes of lecture/activity will be required outside of classroom instruction.

Methods of Instruction/Course Format/Delivery:

Methods of Instruction/Course Format/Delivery: Methods employed will include Lecture/demonstration, discussion, problem solving, analysis, and reading assignments. Homework will be assigned. Faculty may choose from, but are not limited to, the following methods of instruction:

1. Lecture
2. Discussion
3. Internet
4. Video
5. Television
6. Demonstrations
7. Field trips
8. Collaboration
9. Readings

Major Assignments/Assessment:

Faculty may assign both in- and out-of-class activities to evaluate students' knowledge and abilities. Faculty may choose from – but are not limited to -- the following methods: attendance, class preparedness and participation, collaborative learning projects, exams/tests/quizzes, homework, internet, library assignments, readings, research papers, scientific observations, student-teacher conferences, and written assignments.

The Mathematics Department does not accept late work.

Course Grade:

Assignment Weights	
Class Participation	10%
Homework/Quiz Average	15%
Exams	55%
Comprehensive Final Exam	20%

Letter Grades for the Course will be assigned as follows:

A: 90 < Average < 100

B: 80 < Average < 90

C: 70 < Average < 80

D: 60 < Average < 70

F: 00 < Average < 60

Texts, Materials, and Supplies:
- Textbook: PreCalculus (Lippman/Rasmussen) 2nd Edition (No Purchase Necessary)
- Lumen OHM (No Purchase Necessary)
- Canvas Access

Other:
- Courses conducted via video conferencing may be recorded and shared for instructional purposes by the instructor.
- For current texts and materials, use the following link to access bookstore listings: https://www.panolacollegestore.com
- For testing services, use the following link: https://www.panola.edu/student-services/student-support/academic-testing-center
- If any student in this class has special classroom or testing needs because of a physical learning or emotional condition, please contact the ADA Student Coordinator in Support Services located in the Charles C. Matthews Student Center or go to https://www.panola.edu/student-services/student-support/disability-support-services for more information.
- Panola College welcomes pregnant and parenting students as a part of the student body. This institution is committed to providing support and adaptations for a successful educational experience for pregnant and parenting students. Students experiencing a need for accommodations related to pregnancy or parenting will find a Pregnancy and Parenting Accommodations Request form in *The Pathfinder* or may request the form from the course instructor.
- Withdrawing from a course is the student's responsibility. Students who do not attend class and who do not withdraw will receive the grade earned for the course.
- Student Handbook, *The Pathfinder: https://www.panola.edu/* (located at the bottom under students)