

MATH 0130

COURSE DESCRIPTION

SEP. 18 2001

INSTRUCTOR: Dr DEVINDER S SEKHON PHD
OFFICE: C 417 **PHONE:** 539 - 2991

TEXT BOOK: MATHPOWER 12 PUBLISHED BY MCGRAW - HILL

COURSE GOALS: To provide a basic knowledge in selected areas of math, and help students in developing, and mastering skills to solve problems in those areas. Also to develop an appreciation for the importance of math in general, and in our daily life.

PREREQUISITES: Math 0120 or equivalent, or Math 0130 placement.

ATTENDANCE AND LATENESS: Regular attendance is expected of all students, and is crucial to passing the course. Students who miss classes will soon find themselves falling behind, and failing. **An unexcused absence of 20% or higher may result in the student being barred from the final exam.** Lateness is **NOT** permitted because it interrupts the class.

ASSIGNMENTS, TESTS AND EXAMS: All tests and exams **MUST** be written on scheduled times unless **PRIOR** arrangements have been made with the instructor. A missed test or exam will result in a score of **ZERO** for that test or exam (Sickness excepted in which case a proof may be required). All assignments must also be handed in by the due date and time. Late handing in of assignments will be subject to heavy penalties.

COURSE CONTENT:

- **REVIEW OF POLYNOMIALS:** Factoring; Translations of graphs; Reflection of functions
- **EXPONENTS AND LOGARITHMS:** Exponential functions; Growth and Decay; Exponential equations; Problem solving; Definition of logarithms; Laws; Logarithmic equations; Continuous growth and decay.
- **TRIGONOMETRY:** Angular measure; Trigonometric ratios; Period and amplitude; Graphing sine and cosine functions; transformations of sine and cosine functions; Applications of sinusoidal functions; Other trigonometric functions; Sums and differences of angles. Trigonometric equations; Trigonometric identities.

- **CONIC SECTIONS:** The circle; The ellipse; The hyperbola; The parabola. Their equations, and solving problems involving the conic sections.
- **SEQUENCES AND SERIES:** Arithmetic and Geometric sequences and series. General terms, and summations; Geometric sequences and compound interest; Infinite geometric series. Problem solving.
- **PERMUTATIONS AND COMBINATIONS:** The fundamental counting principle; Permutations, and combinations; Problem solving. Pascal's Triangle; The binomial theorem.
- **PROBABILITY AND STATISTICS:** Probability and sample space; Reasonable assumptions; Classifying events; probability and combinatorics. Average(mean), mode, and the median; Standard deviation; Z-scores; Normal distribution Applications, and problem solving.

COURSE EVALUATION: The final grade in the course will be based on your performance on various tests, assignments, and exams as follows:

4 Tests	=	23%
3 Assignments	=	19%
Midterm Exam	=	20%
Final Exam	=	38%

OBJECTIVES OF THE COURSE

The following are the minimum objectives which must be achieved by you over the semester. Some changes to objectives may be introduced later as per the need.

UNIT 1. FUNCTIONS AND TRANSFORMATIONS: On completing this unit, you should be able to

- Factor a given polynomial, where possible, using the formulas of difference of two squares, the sum and the difference of two cubes, and by taking a common factor.
- Plot the graphs of quadratic, cubic, higher polynomial, rational, and exponential functions. Also be able to plot the absolute value, and the square root functions.
- Given a graph of any of the above functions, be able to plot the graph of a related function using horizontal and vertical translations, reflections, and stretching.
- Solve related problems

An assignment worth 4% of the course will follow this unit

UNIT 2. EXPONENTS AND LOGARITHMS: On completing this unit, you should be able to

- Define the terms - base and the exponent - of an exponential relation.
- Develop a model for exponential growth, and decay.
- Solve related problems.
- Solve exponential equations.
- Determine the doubling period, or any other time period for an exponential growth, or exponential decay.
- Plot graphs of exponential and logarithmic relations
- Solve related problems.
- Define logarithmic relationships, and be able to interconvert exponential and logarithmic relations.
- State laws of logarithms, and apply them to solve related problems.
- Evaluate logarithms.
- Solve problems based on logarithmic formulas, including Richter, and pH scales, and continuous growth or decay.
- Solve logarithmic equations.
- Prove logarithmic identities.

Write test worth 6% of the course on this unit

UNIT 3. TRIGONOMETRY: On completing this unit, you should be able to

- Define the radian as a measure of an angle; and be able to convert radians into degrees and vice-versa.
- Define principal, and coterminal angles, and state relation between them.
- Define the trigonometric ratios - sine, cosine, and tangent - of an angle, and determine the exact values of the above trigonometric ratios for select angles.
- Solve problems based on the above ratios.
- Define period, and amplitude of periodic functions, and plots graphs of sine and cosine functions.
- Determine the period and the amplitude of a periodic function from a given graph, and be able to write the equation of the function.
- Use transformations to plot the graphs of sine and cosine functions.
- Develop models using sinusoidal functions, and be able to solve related problems.
- Define other trigonometric (reciprocal) functions, and state mathematical relations between different trigonometric functions.
- Solve trigonometric equations giving specific, and general solutions.
- State the trigonometric identities involving the sums, and the differences of two angles.
- Solve related problems
- Prove trigonometric identities.

An assignment worth 8% of the course will follow this unit.

MIDTERM EXAM, WORTH 20% OF THE FINAL GRADE, WILL ALSO BE GIVEN AT THE END OF THIS UNIT

UNIT 4. CONIC SECTIONS: On completing this unit, you should be able to

- Define all the four conic sections - the circle, the ellipse, the hyperbola, and the parabola - in mathematical terms.
- Give the general equation of each of the individual conic sections, and the common general equation for all of them.
- Identify the appropriate conic section from the general equation.
- Give the standard equation for each of the four conic sections.
- Determine the equation of the **circle** when the coordinates of the centre, and either the radius, or the coordinates of a point lying on the circle, are given.
- Determine the coordinates of the centre, and the radius of the circle for which the equation is given. And be able to draw the sketch of the circle.
- Solve the related problems.
- Define the major and the minor axes, and the foci of the **ellipse**. Also state the relation between a , b , and c .
- Determine the equation of the ellipse for which the coordinates of the centre, and those of the foci are given.
- Determine the coordinates of the centre, the lengths of the two axes, and the

- coordinates of the vertices and the foci of the ellipse for which the equation is given. Be able to draw the sketch of the ellipse.
- Solve the related problems.
 - Define the transverse axis, the conjugate axis, the foci, and the vertices of the **hyperbola**. Also state the relation between a , b , and c .
 - Define asymptotes.
 - Determine the equation of the hyperbola for which the coordinates of the centre, and those of the vertices are known.
 - Determine the centre, the vertices, the lengths of the axes and the asymptotes of the hyperbola for which its equation is given. Also be able to draw the sketch of the hyperbola.
 - Solve the related problems.
 - Define the focus, the directrix, and the axis of symmetry of the parabola.
 - Determine the equation of the parabola when the coordinates of the focus (or vertex), and the equation of the directrix are given.
 - Determine the equation of the parabola when the coordinates of the vertex (or the focus), and those of a point lying on the parabola are given.
 - Determine the coordinates of the vertex, the equation of the directrix, and the axis of symmetry for the parabola for which the equation is given. Also be able to draw the sketch of the parabola.
 - Solve related problems

Assignment worth 7% of the total grade will follow this unit

UNIT 5. SEQUENCES AND SERIES: On completing this unit, you should be able to

- Define arithmetic sequence, common difference, general term, and recursive formula. Also be able to identify an **arithmetic sequence**.
- To determine the general term and specific terms of an arithmetic sequence.
- Determine the sum of a given arithmetic sequence to a desired number of terms.
- Solve related problems.
- Expand and evaluate expressions written in Sigma notation.
- Define geometric sequence, common ratio, and general term. Also be able to identify a **geometric sequence**.
- To determine the general, and specific terms of a geometric sequence.
- Determine the sum of a given geometric sequence to a desired number of terms.
- Determine the sum of an infinite geometric sequence, and convert a repeating decimal into corresponding fraction.
- Solve related problems.

Write test at the end of this unit worth 5% of the total grade.

UNIT 6: COMBINATORICS - PERMUTATIONS AND COMBINATIONS: On completing this unit, you should be able to

- State the fundamental counting principle.
- Define **permutations** of n objects, and factorials.
- Determine the number of permutations of n different objects when all, or a part are used at a time.
- Determine the number of permutations of n objects when some of them are alike.
- Solve related problems.
- Define combinations of n objects.
- Determine the number of different combinations when r objects are selected out of n different objects.
- Explain Pascal's triangle, and how it is related to combinations.
- Apply the principle of combinations to different situations, and solve related problems.
- Apply combinations to Binomial theorem.

Write test worth 5% of the final grade, on this unit

UNIT 7. PROBABILITY AND STATISTICS: On completing this unit, you should be able to

- Explain probability of an event, probability tree, sample space, Venn diagrams, and statistical sampling.
- Determine probability of an event using probability tree and Venn diagrams.
- Determine probability using combinatorics.
- Solve related problems.
- Define mean, mode, and median for a given set of data, and determine each of them for the data.
- Explain binomial distribution.
- Define standard deviation, and determine standard deviation for given data.
- Apply standard deviation to analyse given data.
- Define z-score, and calculate z-score for a given set of data.
- Apply z-score to solve related problems.
- Explain standard normal curve, and normal distribution.
- Use area under the standard normal curve, and z-scores to solve related problems.

Write test worth 7% of the final grade, on this unit

WRITE FINAL EXAM WORTH 38% OF THE FINAL GRADE