Douglas College

A. Division: Education   Effective Date: September 2010

B. Department / Mathematics/   Revision   **X**   New Course
Program Area: Faculty of Science & Technology

If Revision, Section(s)   A, F, H, M, N, P, Q
Revised:
Date of Previous Revision: December 2004
Date of Current Revision: April 2010

C: MATH 1110   **D**: Precalculus   **E:** 4

Subject & Course No.	Descriptive Title	Semester Credits

F: Calendar Description:

This is a one semester course for students who wish to prepare for MATH 1120 Calculus. It covers graphing and solution of equations involving polynomial, rational, circular, trigonometric, inverse trigonometric, logarithmic and exponential functions, in addition to conic sections. This is a challenging course that moves through the topics required for later study of calculus quickly and in depth. Students who have never taken Principles of Math 12 are advised to take MATH 1105 first. A graphing calculator is required.

G: Allocation of Contact Hours to Type of Instruction / Learning Settings

Primary Methods of Instructional Delivery and/or Learning Settings:

Lecture

Number of Contact Hours: (per week / semester for each descriptor)

6

Number of Weeks per Semester:

15

H: Course Prerequisites:

MATH 1101 with a B- or equivalent
OR
MATH 1105 with a C- or equivalent

I: Course Corequisites:

None

J: Course for which this Course is a Prerequisite

MATH 1120

K: Maximum Class Size:

35

L: PLEASE INDICATE**:**

☐ Non-Credit

☐ College Credit Non-Transfer

☒ College Credit Transfer:

SEE BC TRANSFER GUIDE FOR TRANSFER DETAILS (www.bctransferguide.ca)

M: Course Objectives / Learning Outcomes

Upon completion of MATH 1110 the student should be able to:

---FUNCTIONS---

-understand the concept of function and be able to determine which relations are functions by an examination of the equation and/or the graph of the relation.

-find the domain of any function and the range of functions for which the inverse can be determined or for which the graph can be easily sketched.

-extract the functional rule from a 'word problem'.

-determine if a function is odd or even and understand the graphical implication of the property.

-sketch the graphs of the following functions:

$$y = x, \; y = x^2, \; y = x^3, \; y = |x|, \; y = \sqrt{x}, \; y = \frac{1}{x}, \; y = \frac{1}{x^2}, \; y = \sqrt{a^2 - x^2}, \; y = [\![x]\!]$$

and the graphs of the following variations of the above functions:

$$y = f(x) + c, \; y = f(x + c), \; y = -f(x), \; y = cf(x)$$

-apply the above transformations to any given graph or function.

-sketch the graph of simple piece-wise defined functions.

-sketch the graph of any quadratic function and be able to determine all intercepts and the vertex using the quadratic formula and/or completing the square.

-determine the equation of a quadratic from its graphical properties.

-solve maximum-minimum 'word problems' involving a quadratic function.

-add, subtract, multiply and divide functions and be able to determine the domains of the resulting functions.

-determine the composite of several functions and its domain.

-determine the inverse of a given one-to-one function and the domain and range of the inverse function.

-prove that a given function is the inverse of another given function.

-sketch the graph of the inverse of a given one-to-one function when the inverse functional rule cannot be determined.

-understand the polar coordinate system and be able to graph a function written in polar coordinates. (optional)

-sketch the graph of a plane curve given by a set of parametric equations. (optional)

-find parametric equations of basic plane curves. (optional)

----------------------------------POLYNOMIAL AND RATIONAL FUNCTIONS--------------------------

-find the quotient and remainder when a polynomial is divided by a second polynomial.

-use the remainder theorem.

-use the factor theorem to find the real roots of polynomial equations and the real zeros of polynomial functions.

-determine the multiplicity of zeros.

-use the rational root test to determine all possible rational roots.

-factor and graph any polynomial of degree **n** provided that the polynomial has at least **n-2** rational roots.

-obtain the functional rule for a polynomial when given certain information about the roots and a value that satisfies the function and graph the function.

-sketch the graph of proper and improper rational functions that have a most one horizontal asymptote or an oblique asymptote.

-solve 'word problems' that involve polynomial or rational functions.

-------------------------------EXPONENTIAL AND LOGARITHMIC FUNCTIONS--------------------

-find the exact value of logarithmic and exponential expressions.

-use a calculator to approximate the logarithm of a number to any base.

-use a calculator to approximate the solutions to exponential and logarithmic equations for all bases.

-find the inverse of a given exponential or logarithmic function and the domain and range of the inverse function.

-demonstrate an understanding of the rules of logarithms by rewriting given expressions.

-sketch the graph of exponential and logarithmic functions determining the value of all intercepts and the equation of the asymptote.

-solve 'word problems' which require the use of logarithms and/or exponentials; i.e. growth and decay problems and compound interest problems.

-------------------------------------THE TRIGONOMETRIC FUNCTIONS--------------------------------

-convert radians to degrees, minutes and seconds and vice versa.

-solve problems that demonstrate an understanding of the relationship between the central angle, the arc length and the radius of a circle.

-solve problems that demonstrate an understanding of the relationship between the angular velocity, the linear velocity and the radius of a wheel or similar object.

-determine the area of a circular sector.

-demonstrate an understanding of the six trigonometric functions relative to a right triangle and to the unit circle.

-recall and apply the fundamental trigonometric identities, the co-function formulas and the formulas for negatives.

-sketch the graphs of the six basic trigonometric functions and recognise which functions are odd and which functions are even.

-find the exact values of the remaining trigonometric functions given the values of two trigonometric functions or the value of one trigonometric function and the quadrant.

-find the exact values of the trigonometric functions for an angle in standard position given a point on the terminal side.

-find the reference angle of any angle in degrees and/or radians.

-express any trigonometric function as a function of a given trigonometric function.

-recall the exact values of the trigonometric functions for reference angles of 30°, 45°, and 60° and the axis angles.

-use a calculator to approximate the value of the trigonometric function of any real number.

-use a calculator to approximate the reference angle given the value of the trigonometric function.

-determine the amplitude, period and the phase shift of any trigonometric function and sketch its graph showing all intercepts and turning points.

-demonstrate an understanding of the terms 'angle of depression' and 'angle of elevation' and solve 'word problems' involving right triangles.

------------------------------ANALYTIC TRIGONOMETRY AND APPLICATIONS--------------------

-recall or derive and demonstrate an understanding of the addition and subtraction formulas, the double angle formulas and the half-angle identities for sine, cosine and tangent.

-demonstrate an understanding of the product-to-sum and sum-to-product formulas when given the formulas.

-combine a sine function and a cosine function of the same period into a single cosine function when given the formula.

-verify trigonometric identities.

-find all the solutions of trigonometric equations and find solutions on a restricted interval.

-sketch graphs of the six inverse trigonometric functions and state the domain and range of each function.

-sketch the graph of simple inverse trigonometric functions.

-find the exact value of inverse trigonometric expressions.

-simplify given composites of trigonometric and inverse trigonometric functions.

-solve 'word problems' that require the use of the inverse trigonometric functions.

-verify inverse trigonometric identities.

-solve 'word problems' that require the use of the Law of Sines and/or Law of Cosines.

----------------------------------PARABOLAS, ELLIPSES AND HYPERBOLAS------------------------

-find the vertex, focus and directrix of a parabola and sketch its graph.

-find the vertices and foci of an ellipse and sketch its graph.

-find the vertices and equations of the asymptotes of a hyperbola and sketch its graph.

-find an equation of a parabola or ellipse that satisfies given conditions.

N: Course Content:

1. General Functions
2. Polynomial and Rational Functions
3. Exponential and Logarithmic Functions
4. Trigonometric Functions
5. Analytic Trigonometry and Applications
6. Conics

O: Methods of Instruction:

Lectures, problem sessions and assignments

P: Textbooks and Materials to be Purchased by Students:

Stewart, Redlin, Watson, <u>Precalculus: Mathematics for Calculus</u>., Current Edition , Brookes Cole.
A graphing calculator.

Q: Means of Assessment

Evaluation will be carried out in accordance with Douglas College policy. The instructor will present a written course outline with specific evaluation criteria at the beginning of the semester. Evaluation will be based on some of the following:

1. Weekly quizzes   0 – 40 %
2. Tests   20 – 70%
3. Assignments   0 – 15%
4. Attendance   0 – 5%
5. Class Participation   0 – 5%
6. Final Examination   30 - 40 %

R: Prior Learning Assessment and Recognition: specify whether course is open for PLAR

None

Course Designer(s): Allan Majdanac

Education Council / Curriculum Committee Representative

Dean / Director: Thor Borgford

Registrar: Ted James