NORTHWESTERN POLYTECHNIC

DEPARTMENT OF ACADEMIC UPGRADING

COURSE OUTLINE FALL 2022

MA0130 (A3) - Mathematics Grade 12 Equivalent (Pre-Calculus 30-1) 5 (6-0-0) HS
6 hours/ week for 15 weeks (90 hours)

Northwestern Polytechnic acknowledges that our campuses are located on Treaty 8 territory, the ancestral and present-day home to many diverse First Nations, Metis, and Inuit people. We are grateful to work, live and learn on the traditional territory of Duncan's First Nation, Horse Lake First Nation and Sturgeon Lake Cree Nation, who are the original caretakers of this land.

We acknowledge the history of this land and we are thankful for the opportunity to walk together in friendship, where we will encourage and promote positive change for present and future generations.

INSTRUCTOR:	Sheryl Heikel	**PHONE:**	Office: 780–539–2059
OFFICE:	C417	**E-MAIL:**	sheikel@nwpolytech.ca

OFFICE HOURS: **A205** 1:30-2:20 daily
C417 Tuesday-Thursday 2:30 - 3:30 pm or by appointment

CALENDAR DESCRIPTION:

MA 0130 - Mathematics Grade 12 Equivalent (Pre-Calculus 30-1) 5 (6-0-0) HS
This course explores polynomial, radical, rational, exponential and logarithmic functions, transformation and combinations of functions, trigonometry (including the unit circle, graphs, identities and equations), and permutations and combinations.

PREREQUISITE(S)/COREQUISITE:

MA0120 or MA0132 or equivalent, or equivalent math placement test score, or 60% or better in Math 20-1 or Math 30-2 or equivalent within the previous two years.

REQUIRED TEXT / RESOURCE MATERIALS:

Pre-Calculus 12 Work Text, (Pearson)

NON-GRAPHING scientific calculator, If you are purchasing, a TI-30X IIS is recommended.
graph paper (often notes are better taken on graph paper)

DELIVERY MODE(S):

Classroom instruction. Use of D2L (myClass) is required.

COURSE OBJECTIVES: As stated by Alberta Education, https://www.alberta.ca/programs-of-study.aspx

upon successful completion of this course the student will

- Develop trigonometric reasoning.
- Develop algebraic and graphical reasoning through the study of relations.
- Develop algebraic and numeric reasoning that involves combinatorics.

LEARNING OUTCOMES: upon successful completion of this course the student will be able to:

Unit 1 Polynomial Functions

- Divide polynomials with long division and synthetic division.
- Write division statements for polynomials.
- Factor polynomials.
- Use the Remainder Theorems to determine the remainder when a polynomial is divided by a binomial.
- Use the Factor Theorem to find factors.
- Sketch the graph of polynomial functions using the zeros of a function to plot x-intercepts, the constant term as the y – intercept and the leading coefficient as the end behaviour for a graph.
- Write polynomial functions to model situations.

Unit 2 Radical and Rational Functions

- Sketch the graph of a radical function where the radicand is a linear function.
- Sketch the graph of a radical function where the radicand is a quadratic function.
- Compare the domain and range of a radical function to the domain and range of the radicand function.
- Sketch the graph of a rational function.
- Determine whether a rational function will have a vertical asymptote or a hole for a non-permissible value.
- Determine whether a rational function will have horizontal or oblique asymptotes.

Unit 3 Transformations

- Given the graph of any function, be able to sketch the graph of a related function using translations (horizontal and vertical), stretches (about the *x* or *y*-axis), and reflections (in *x*-axis or the *y*-axis*).*
- Given $y = f(x)$ and $y = af(b(x-h))+k$ be able to sketch the graph of a related function using translations (horizontal and vertical), stretches (about the *x* or *y*-axis), and reflections (in *x*-axis or the *y*-axis*).*
- Write an equation to reflect a given translation, reflection, or stretch.
- Identify combinations of transformations to graph or write an equation.
- Graph and find equations for inverse relations.

Unit 4 Combining Functions

- Combine functions graphically to sketch graphs of functions that are the sum, difference, product or quotient to two functions.
- Combine functions algebraically to write equations of functions that are the sum, difference product or quotient to other functions.
- Determine the domain and range for combined functions.
- Determine the value of a composition of functions at a point.
- Determine the equation of a composition function.
- Sketch the graph of a composition function.
- Identify restrictions for composition functions.

Unit 5 Exponential and Logarithmic Functions

- Plot graphs of exponential & logarithmic functions and describe their characteristics.
- Apply transformations to the equations and graphs of exponential & logarithmic functions.
- Evaluate logarithms to find exact values.
- Use the laws of exponents and laws of logarithms to simplify expressions.
- Define logarithmic relationships and be able to interconvert exponential and logarithmic relations.
- Solve exponential & logarithmic equations.
- Evaluate common and natural logarithms using a calculator.
- Solve problems by modelling situations with exponential and logarithmic equations.

Unit 6 Trigonometry

- Define the primary and reciprocal trigonometric ratios of an angle.
- Define principal and coterminal angles, and state relationship between them.
- Define radian measure of an angle; be able to convert radians to degrees and vice-versa.
- Given one trigonometric ratio of an angle, determine the other 5 ratios.
- Determine reference angle and apply the CAST rule.
- Determine exact values of trigonometric ratios for special angles on the unit circle.

Unit 7 Trigonometric Equations and Identities

- Solve first and second degree trigonometric equations giving specific and general solutions.
- Verify an identity is true for a specific value of the variable.
- Prove trigonometric identities for all defined values of the variable.
- Apply sum and differences identities as well as double angle identities.
- Define period and amplitude of a periodic function.
- Plot graphs of the basic sine, cosine and tangent functions.
- Determine the period and the amplitude of a periodic function from a given graph, and be able to write the equation of a sinusoidal function given its graph.
- Use transformations to plot the graphs of more complex sine and cosine functions.
- Solve application questions involving sinusoidal functions.

Unit 8 Permutations and Combinations

- Apply the fundamental counting principle to determine the number of different ways to perform multi-step operations.
- Use factorial notation to determine permuations and combinations, or to solve for *n* or *r.*
- Determine the number of permutations of *n* different objects when all, or part, are used at a time.
- Determine the number of permutations of *n* objects when some of them are identical.
- Define combinations of *n* objects.
- Determine the number of different combinations when *r* objects are selected from *n* different objects.
- Apply the principle of combinations to different situations, and solve related problems.
- Explain Pascal's triangle and how it is related to combinations and the Binomial Theorem.
- Use the Binomial Theorem to expand a binomial or to find a specific term in the expansion of a binomial where the exponent *n* is a natural number.

TRANSFERABILITY:

Grade of D or D+ may not be acceptable for transfer to other post-secondary institutions. Students are cautioned that it is their responsibility to contact the receiving institutions to ensure transferability. This course is listed in the Alberta Transfer Guide as equivalent to Math 30-1. **Although 50% (D) is considered a pass for this course, it is strongly recommend that you achieve a mark of 65% (C) to be successful at the next level.

EVALUATIONS: Course final grade will be based on the following components.

4 Section Tests (8%, 8%, 16%, 8%)	40%
Midterm Exam	25%
Final Exam (Cumulative)	35%

All tests and exams MUST be written at the scheduled times unless **PRIOR** arrangements have been made with the instructor. A missed test (exam) will result in a score of ZERO on that test (exam). Only in very specific cases may student be given an opportunity to make up a missed exam (student will be presented with a different version of the exam). Doctor, lawyer or police documentation may be required. The final exam is 3 hours long and is scheduled by the registrars' office during Northwestern Polytechnic Exam weeks. Do not book vacation in this time period.

GRADING CRITERIA: Final Grades will be assigned on the Letter Grading System.

Alpha Grade	4-point Equivalent	Percentage Guidelines		Alpha Grade	4-point Equivalent	Percentage Guidelines
A+	4.0	90-100		C+	2.3	67-69
A	4.0	85-89		C	2.0	63-66
A-	3.7	80-84		C-	1.7	60-62
B+	3.3	77-79		D+	1.3	55-59
B	3.0	73-76		D	1.0	50-54
B-	2.7	70-72		F	0.0	00-49

COURSE SCHEDULE / TENTATIVE TIMELINE:

Math 0130 consists of 8 units divides into 4 sections. Exam dates to be announced.

A. Polynomial Functions (text ch 1) Radical and Rational Functions (text ch 2)	8%
B. Transformations of Functions (text ch 3) Combining of Functions (text ch 4)	8%
Midterm Exam	**25%**
C. Exponential and Logarithmic Functions (ch 5) Trigonometry (ch 6)	16%
D. Trigonometric Equations and Identities (ch 7) Permutations and Combinations (ch 8)	8%

STUDENT RESPONSIBILITIES:
Refer to the NWPolytechnic Policy on Student Rights and Responsibilities at
https://www.nwpolytech.ca/about/administration/policies/index.html

MA0130 is required for many post-secondary programs. In taking this course, the primary goal is that students will develop their appreciation, understanding of and ability to use

mathematics. Students in this course are also learning how to prepare for the demands and expectations of post-secondary education.

The Academic Upgrading Department is an adult education environment. Students are expected to show respect for each other as well as faculty and staff. Students are expected to participate fully in achieving their educational goals.

Certain activities are disruptive and not conducive to an atmosphere of learning. In addition to the *Student Rights and Responsibilities* as set out in the Northwestern Polytechnic calendar, the following guidelines will maintain an effective learning environment for everyone. We ask the cooperation of all students in the following areas of classroom deportment.

1. Check **D2L** as well as **Northwestern Polytechnic email** on a regular basis.

2. **Attendance**: Regular attendance and class participation is expected of all students and is crucial to good performance in the course. Class interruption due to habitual late arrival or leaving early will not be permitted.

3. **Once in class** – remain in class. Leaving to get a coffee is disruptive for others. Any behavior that interferes with the learning of others is not acceptable.

4. Assignments must be submitted on time.

5. Exams must be written on the days announced in class.

6. If an emergency prevents attendance on an exam day, students must contact me before the end of the exam (as soon as possible) via phone or email, and may be asked to provide documentation to justify their absence.

7. No unspecified electronic devices will be permitted during exams.

8. Complete daily homework.
   At least 1.5 hours of study per day outside of class time is required.

9. Take responsibility for your learning.

10. **Please communicate all requests regarding appointments, etc via email**.

STATEMENT ON PLAGIARISM AND CHEATING:

Cheating and plagiarism will not be tolerated and there will be penalties. For a more precise definition of plagiarism and its consequences, refer to the Student Conduct section of the NWPolytechnic Calendar at https://www.nwpolytech.ca/programs/calendar/ or the NWPolytechnic Policy on Student Misconduct: Plagiarism and Cheating at https://www.nwpolytech.ca/about/administration/policies/index.html

**Note: all Academic and Administrative policies are available on the same page.