

# Math4U

김동기 <sup>선생</sup> 수학교실 SINCE 1981



## The Preparing for University Math Program (PUMP)

### What is PUMP?

The Preparing for University Math Program (PUMP) is designed for students who have not taken the appropriate high school mathematics prerequisites for university calculus and linear algebra. It equips students with the necessary background knowledge required to succeed in first year mathematics courses. PUMP may also be taken by individuals who wish to close any existing gap between high school math and University level math courses or anyone who wish to review high school math before attempting University level math or other science courses.

### PUMP Sessions

PUMP sessions are designed for adult learners therefore registration will not be accepted for students currently enrolled in high school. This is structured to facilitate the pace of the group and is directly impacted on by the group dynamics.

### Who need PUMP?

Ontario high school students are applying on Engineering, all science, math, and commerce programs in his / her university or college.

Students already enrolled in their University or college, may use PUMP to upgrade their mathematics skills in order to prepare for the first year math courses.

### What is the required background for PUMP?

Even though PUMP covers pre-university level math material, a certain background knowledge is required. In general terms, a student must have a working knowledge of basic high school algebra, linear quadratic functions and elementary analytic geometry.

Students who do not have the above-mentioned background may still take PUMP and do well provided they are prepared to work extra hard, especially in the first three weeks .

### What does PUMP cover?

PUMP focuses on the mathematical background needed for entry-level university science courses, expanding and developing relevant skills and techniques of reasoning. It includes a thorough review of

primary algebraic, geometric and trigonometric results and methods as well as an introduction to the fundamental ideas underlying calculus, its elementary properties and applications.

### **Topics to be covered:**

#### **Fundamental algebraic background:**

sets, operations and properties. Numbers, fractions, exponents and rational expressions. Factorization and reduction. Completing the square. Binomial expansion. Operations with general algebraic expressions. Properties.

#### **Equations, inequalities and systems:**

equations in quadratic form. Absolute value, rational and radical equations. . General equation solving. Polynomial, rational and absolute value inequalities. General solving and graphing of algebraic inequalities. Systems of linear equations. Gaussian elimination. Non-linear systems and systems containing inequalities. General system solving. Setting up equations, inequalities and systems. Working with word problems. Applications.

#### **Fundamental trigonometric background:**

The number  $\pi$ . Radians and degrees. Trigonometric functions and their graphs. Generalizations and inverse trigonometric functions. The algebra of trigonometric identities and equations. Right triangle trigonometry. The law of sines and the law of cosines. Applications.

#### **Exponential and logarithmic functions:**

the number  $e$ . Exponential functions and their graphs. The inverse of an exponential function. Logarithmic functions and their graphs. Properties of the logarithms. Exponential and logarithmic equations and inequalities. Exponential growth and decay. Applications.

#### **Analytic geometry and introductory calculus:**

rectangular and polar co-ordinates. Basic formulas, equations and graphing. Lines, parabolas, circles, ellipses and hyperbolas. The tangent line problem. Limits and derivatives. Computing limits and the algebra of limits. Continuity. Computing derivatives and the algebra of derivatives. Derivatives of trigonometric, exponential and logarithmic functions. The chain rule and implicit differentiation. Integrals. Basic applications of derivatives and Integrals.

#### **Additional topics (if time permits):**

Sequences and series. Complex numbers and vectors. Mathematical induction. Matrices and determinants. PUMP provides the necessary mechanical foundations upon which the greater generality and abstraction of university mathematics is based. PUMP participants will be exposed to an inside view of what to expect in their future university math courses, how to cope with the demands of courses, and what their prospects are.

### **What are the advantages of PUMP?**

PUMP provides the necessary mechanical foundations upon which the greater generality and abstraction of university mathematics is based.

PUMP eliminates the stress associated with competing for grades and allows each student to fully concentrate on his/her own critical shortcomings.

PUMP participants will be exposed to an inside view of what to expect in their future university math courses, how to cope with the demands of courses, and what their prospects are.