

## **Pre-Calculus - Grade 11**

## **Pre-Calculus - Grade 12**

### **Algebra and Number**

- demonstrate an understanding of the absolute value of real numbers
- solve problems that involve operations on radicals and radical expressions with numerical and variable radicands
- solve problems that involve radical equations (limited to square roots)
- determine equivalent forms of rational expressions (limited to numerators and denominators that are monomials, binomials or trinomials)
- perform operations on rational expressions (limited to numerators and denominators that are monomials, binomials or trinomials)
- solve problems that involve rational equations (limited to numerators and denominators that are monomials, binomials or trinomials)

## Pre-Calculus - Grade 11

### Trigonometry

- demonstrate an understanding of angles in standard position ( $0^\circ$  to  $360^\circ$ )
- solve problems, using the three primary trigonometric ratios for angles from  $0^\circ$  to  $360^\circ$  in standard position
- solve problems, using the cosine law and sine law, including the ambiguous case

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- demonstrate an understanding of angles in standard position, expressed in degrees and radians
- develop and apply the equation of the unit circle
- solve problems, using the six trigonometric ratios for angles expressed in radians and degrees
- graph and analyze the trigonometric functions, sine, cosine and tangent to solve problems
- solve, algebraically and graphically, first and second degree trigonometric equations with the domain expressed in degrees and radians
- prove trigonometric identities

## Pre-Calculus - Grade 11

### Relations and Functions

- factor polynomial expressions where  $a$ ,  $b$  and  $c$  are rational numbers
- graph and analyze absolute value functions (limited to linear and quadratic functions) to solve problems
- analyze quadratic functions of the form  $y = a(x - p)^2 + q$
- analyze quadratic functions of the form  $y = ax^2 + bx + c$  to identify characteristics of the corresponding graph and to solve problems
- solve problems that involve quadratic equations
- solve algebraically and graphically, problems that involve systems of linear-quadratic and quadratic-quadratic equations in two variables
- solve problems that involve linear and quadratic inequalities in two variables
- solve problems that involve quadratic inequalities in one variable
- analyze arithmetic sequences and series to solve problems

## Pre-Calculus - Grade 12

- demonstrate an understanding of operations on, and compositions of, functions
- demonstrate an understanding of the effects of horizontal and vertical translations on the graphs of functions and their related equations
- demonstrate an understanding of the effects of horizontal and vertical stretches on the graphs of functions and their related equations
- apply translations and stretches to the graphs and equations of functions
- demonstrate an understanding of the effects of reflections on the graphs of functions and their related equations, including reflections
- demonstrate an understanding of inverses of relations
- demonstrate an understanding of logarithms
- demonstrate an understanding of the product, quotient and power laws of logarithms
- graph and analyze exponential and logarithmic functions

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### Relations and Functions

- solve problems that involve exponential and logarithmic equations
- demonstrate an understanding of factoring polynomials of greater than 2 (limited to polynomials of degree  $\leq 5$  with integral coefficients)
- graph and analyze polynomial functions (limited to polynomials of degree  $\leq 5$ )
- graph and analyze radical functions (limited to functions involving one radical)
- graph and analyze rational functions (limited to numerators and denominators that are monomials, binomials or trinomials)

## Pre-Calculus - Grade 11

### Permutations, Combinations and Binomial Theorem

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- apply the fundamental counting principle to solve problems
- determine the number of permutations of  $n$  elements taken  $r$  at a time to solve problems
- determine the number of combinations of  $n$  different elements taken  $r$  at a time to solve problems
- expand powers of a binomial in a variety of ways, including using the binomial theorem (restricted to exponents that are natural numbers)