In grade 12, we learned a few elementary functions.

Polynomials

A polynomial is a function having the form of

$$a_n x^n + a_{n-1} x^{n-1} + \cdots + a_1 x + a_0$$

where the powers of x must be integer and $a_i \in \mathbb{R}$.

Property 1. *A odd degree(n is odd) polynomial goes through quadrant I,III if the leading coefficient of it is positive($a_n > 0$), and goes through quadrant II,IV when leading coefficient is negative($a_n < 0$).*

While a even degree(n is even) polynomial goes through quadrant I,II if the leading coefficient of it is positive($a_n > 0$), and goes through quadrant III,IV when leading coefficient is negative($a_n < 0$).

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Rational functions

Rational functions are functions having the following form

$$\frac{p(x)}{q(x)} = \frac{a_n x^n + a_{n-1} x^{n-1} + \cdots + a_1 x + a_0}{b_m x^m + b_{m-1} x^{m-1} + \cdots + b_1 x + b_0}$$

where we can see that $p(x)$ and $q(x)$ are both polynomials.

Property 2. *Vertical Asymptote: It occurs at those x's which make the denominator 0.*

Hole: It occurs at those x's which make the denominator 0 and the term that causing this can be canceled in the function.

Horizontal Asymptote: When $n < m$, the horizontal asymptote will occur at $y = 0$; when $n = m$, the horizontal asymptote will occur at $y = a_n/b_n$.

Exponential Functions

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Logrithms

Logarithmic functions are the inverse of the exponential functions, thus logarithmic functions and exponential functions are symmetric about the $y = x$ line.

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Trigonometric Functions

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