0 Equations & Inequalities

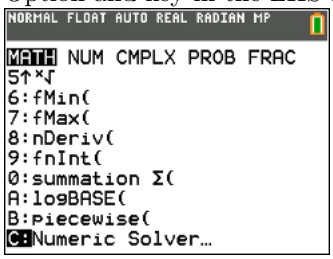
0.1 Solving Equations using GC

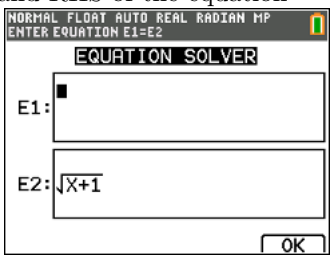
0.1.1 Graphical Method

Graph out the left and right side of the equation as 2 seperate graphs and solve for it's intercept

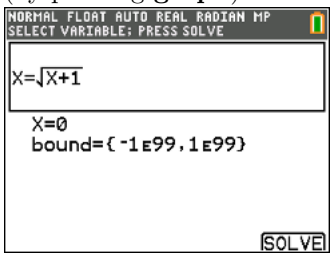
0.1.2 Equation Solver (Not Recommended)

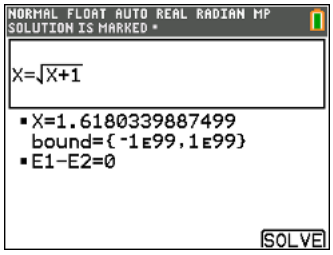
Press the **math** button and select the Numeric Solver Option and key in the LHS and RHS of the equation





Do note that you would have to key a guess (in this case it's $x = 0$) before you are able to solve for the equation (by pressing **graph**)





0.2 System of Linear Equations

An equation is linear when the variables have a power of 1

General Form : $\sum_{i=1}^{n}(a_i x_i) = b$, where $a_i, b \in \mathbb{R}$

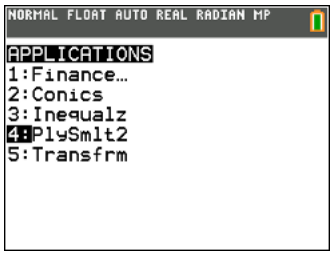
Linear Equations	Non-Linear Equations
$x - 2y + 3z = 180$, $2x_1 + x_2 - 10x_{=}350$	$xy = 1$, $x^2 + 3y = 1$

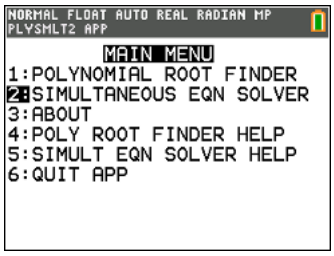
A System of Linear Equations have 3 possible outcomes

- Exactly one Solution (Unique)
- Infinitely many Solutions
- No Solutions

No Solution $\implies$ Inconsistent
At least 1 Solution $\implies$ Consistent

0.2.1 Solving with GC





We can use the simultatneous equation solver under the 'pltSmlt2' App to solve our system

When a system has infinitely many solutions

The solutions are represented with a 'free' variable

Example:

$x = z - 2$

$y = 3z + 2$

$z = z$

In this case, z is the 'free' variable that determines the values of x & y, thus it has infinitely many solutions. The unique solution is determined by the context given

Example : If $z = 3$, then $x = 1$, $y = 11$

0.3 Inequalities

0.3.1 Basic Concepts

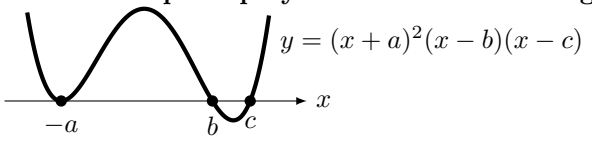
Let $a, b, c, d \in \mathbb{R}$

Properties
If $a > b$ & $b > c$, then $a > c$
If $a > b$ & $c > 0$, then $ac > bc$ & $\left(\frac{a}{c} > \frac{b}{c}\right)$
If $a > b$ & $c < 0$, then $ac < bc$ & $\left(\frac{a}{c} < \frac{b}{c}\right)$
If $a > b$ & $c > d$, then $a + c > b + d$ But $a - c > b - d$ may not be true
If $a > b > 0$ & $n > 0$, then $a^n > b^n$ & $\left(\frac{1}{a^n} < \frac{1}{d^n}\right)$
If $a > b$, then $f(a) > f(b)$ if f is monotonic increasing then $f(a) < f(b)$ if f is monotonic decreasing

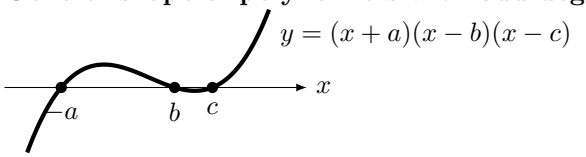
0.3.2 Polynomial Inequalities

For such inequalities in the form $f(x) \geq 0$ or other inequality signs We can solve it by looking at the general shape of the function or the test point method, after determining the roots of the equation

General shape of polynomials with even degrees



General shape of polynomials with odd degrees



Steps to Solve the inequality

1. Factorize the equation
2. Draw a number line with the roots of the equation
3. By either graph or test point, determine the sign of each section
   A section is the "gap" between roots and the ends
4. Write out the final inequality

Graph method is to mentally graph out the shape of the graph to determine the sign of each section, while test point is to test a number within that section (e.g using 1 for $0 < x < 2$)to determine the sign

0.3.3 Inequalities involving Rational Functions

0.3.4 Inequalities involving Modulus Functions

0.3.5 Using a Graphical Method