THE SUPER OPERATORS PARADGIM:

A new paradgim for solving equations algebraically.

In traditional algebra we use to interact values by using operators, the values Eare often being the numbers and the operators are often being the arithmetic operators.

Doing any arithmetic operation we can encounter a situation in which we want to identify a number which can give us a certain result when interacted with other numbers by various arithmetic operators , these situations are called equations and that number we want to figure out is called an unknown often denoted by x.

Example when we are in a situation in which we want to find a number to be added with 5 so as to get 12 as a result , this situation can be represented by the equation $x+5=12$, here our values are {5,12} where 12 is the result , operators are {+,=} and an unknown or a parameter or a variable is {x}.

In traditional algebra , solving equations like $x+5=12$ is quite easy by using algebraic techniques like adding the additive inverse of 5 both sides which is -5 and stating that $x+0=x$ then obtaining x that is $x+5 + -5=12+ -5$ which we get $x+0=7$ hence $x=7$, also it involves using other techniques like quadratic formula , exponents and logarithms rules and factoring.

depending on the nature of the equation, but despite all of these techniques there exists the kind of equations that can not being solved by those traditional algebraic techniques because these equations are too complex, non-linear, or have no closed-form solution. In those cases, people tend to use numerical methods like Newton-Raphson method for those cases that the traditional algebraic techniques become irrelevant.

Some examples of those kind of equations which are too complex to solve in a traditional sense are like :

$e^{x}=x^{2}$, $\cos x=x$, $\sin x+\log x=8$, $x^{x-3}+2^{x}=7x$, $2^{x}+x=5$, etc .

The super operator paradgim aims at solving those kinds of transcendental equations , non linear equations and implicit equations by simply isolating the unknown hence obtaining an algebraic solution.

In super operators paradigm we use to interact operators by using super operators , we will see how the idea of interacting operators by using the super operators becomes useful in isolating variables so as to solve any equation algebraically .

The idea of interaction of operators came from 1. solutions to explicit equations , 2. solutions to implicit equations 3. preservation of truth.

The axioms of super operators formation:

1.For an expression or equation ; as you swap two terms , the operators must change so as to preserve truth.

2. Swapping of terms in equations are used for isolating variables.

3.Those things which having relationship to each other , they are the function of each other.

4.If change in one thing causes the change in another thing , then these things are in relation to each other.

5.Initial information must be preserved after swapping.

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6. The syntax for interaction of values : (value1) operator(value2) =value3.
Where (value)=value.

7. The syntax for interaction of operators : <super operator, operator1, operator2>= operator3.

8.The recursive definition of an operator : operator=<ne,operator,em>
where ne is the neutral super operator or default super operator and em is the empty operator or default operator.

Solving for an unknown in an equation is implemented by rearranging the components of equations by suitable rules of swapping , associativity , and implicit to explicit conversion.

The rules of swapping:

Recall axiom 1 , swapping two components in an equation , the operators must change so as to preserve truth , example 3+2=5 is true but if we swap 5 and 3 we get 5+2=3 which is false , so in order to preserve truth ; the operator “+” must change to the operator “-” to form 5-2=3 which is true the idea of swapping can hep us to solve the equation like x+2=5 , that is here you can swap 5 with x so as to put x in an isolated state here we get 5-2=x therefore x=3 .

Generally if we have the parameters a, b, and c which stands for values and a parameter W which stands for an operator by axiom 6 we can describe an abstract interaction defined as aWb=c .

The abstract interaction aWb=c symbolizes the format of the explicit equations , here we can see that the solutions to explicit equations can be obtained simply by swapping a, b and c.

Making “a” the subject in aWb=c :
Here we need to isolate “a” , this can be done by swapping it with “c”
the swap between a and c causes W to change to another operator lets it be M so as to preserve truth,
here we get cMb=a .

Making “b” the subject in aWb=c:
Here we isolate “b” by swapping it with “c”
the swap between b and c causes W to change to another operator lets it be N so as to preserve truth,
here we get aNc=b.

Now we can ask ourselves what about swapping “a” and “b” ? is it relevant? , yes it is relevant ! , consider the following exponentiation interaction; 3^2=9 , swapping 3 and 2 in 3^2 forms 2^3, but 2^3=8 , hence 3^2 is not equals to 2^3 hence we can infer that for aWb ; if we swap “a” and “b” the operator W must change in that expression so as to preserve truth , let the new resulting operator be D hence aWb=bDa

Relationship between operators before swapping and operators after swapping :
Recall axiom 5 , the axiom 5 is useful in reducing the burden of introducing new operators now lets use axiom 7 and axiom 8 in creating the rules which shows how operations change after swapping .

Rule1. M=<box,W,em>

Rule2. N=<hat,W,em>

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Rule3. D=<bar,W,em>

Thus now we have the following possible forms of explicit equations:
for aWb=c we have: c<box,W,em>b=a , a<hat,W,em>c=b, b<bar,W,em>a=c.

Lets brand all those transformations as the “explicit rule”.
Also we can have a rule known as extended commutative rule defined as aWb= b<bar,W,em>a.

Solution to implicit equations:
Implicit equations are the one in which a variable repeats more than once in an equation.

The fundamental implicit equation is (xAa)Bx=b . for the kind of equations like (xAa)Bx=b to be solved ; they must be converted to explicit form because its equivalent explicit form will have a single x .
Now in order to express the implicit equation (xAa)Bx=b we must define a rule for expressing it in to its equivalent explicit form .
Lets call it “the mplicit to explicit rule ” and define it as : (xAa)Bx=b is equivalent to x<so,A,B>a=b

Now we can easily solve for x as follows :
given (xAa)Bx=b which is equivalent to x<so,A,B>a=b , solving for x here is just isolating x by swapping it with the already isolated variable which is b hence by the explicit rule above which states that for aWb=c we have: c<box,W,em>b=a , hence for x<so,A,B>a=b we get b<box,<so,A,B>,em>a=x .

Therefore the solution to implicit equation (xAa)Bx=b is x=b<box,<so,A,B>,em>a.

Complex implicit equations :
While converting any complex implicit equation to be In to its equivalent explicit form you will encounter expressions of the form aG(bRc) which forms the interactions like aG(bRc)=d .

For the expressions of the form aG(bRc) , the rearrangements of parameters can easily be captured by the extended associative rule and the extended distributive rule so as to make the isolation process become much easier rather than using swapping , although we can still use swapping here but swapping will lead to something a bit more complicated.

Now the extended associative rule is defined as aG(bRc)=(a<sa,G,R>b)<seo,G,R>c.

And the extended distributive rule is defined as aG(bRc)=(aGb)<si,G,R>(aRc).