The Calculus: A Powerful Psychological and Critical Thinking Tool

Appreciation of the calculus

In his text book on "General Semantics", "Science And Sanity", page 574, Alfred Korzybski the founder of the system wrote: "It is not an exaggeration to say that the calculus is one of the most inspiring, creative, structural methods in mathematics…It is *structurally and semantically the logic of sanity*… and on page 575, "The present work is also to a large extent inspired by it, and develops simple non-technical methods by which the psycho-logical structural semantic reaction necessitated by the calculus can be given to the masses in elementary education without any technical knowledge of it." In wanting to learn more about general semantics, I thought I should also learn something about the calculus beyond my high school rote exercises which offered no explanation as to what the calculus was about. So I bought some books on the calculus. In his book "A Tour of the Calculus" page xvi, David Berlinski wrote: "I have written this book for men and women who wish to understand the calculus as an achievement in human thought." In "Mathematics A Cultural Approach", page 396, Morris Kline wrote: "The most significant creation of that century (the 17th.) and the one which proved to be the most fruitful for the modern development of mathematics and science is the calculus. Like Euclidean geometry, it is a landmark of human thought." From studying these books and others, I developed a strong appreciation of 'the calculus' and its potential applicability to life situations, clear thinking and reasoning.

A definition of the calculus

Here is a 'definition' of the calculus, a working reformulation of many others: "The study of a continuous function by following its development/history through indefinitely small steps." (Some think that this 'definition' provides a good description of meditation.) From years of research, Korzybski considered the methods and approach of science and mathematics, two of humanity's most successful enterprises (functions of human curiosity guided by the calculus), as excellent examples of human thinking at its best in terms of clarity, reliability,

and predictability--and as such, worth copying as models for human evaluation. He created general semantics: "a set of interrelated principles…constituting generalizations of the methods and approach of science and mathematics", to be used as guides, and psychological working tools towards promoting our individual time-binding intelligence and the sanity of the human race.

A memorable "aha" experience

I had a most enjoyable and memorable experience when I realized that the 'definition' of the calculus can be used heuristically and self-reflexively to help us gain some understanding of the definition and just a teensy-weensy glimpse of what the calculus is about. The exercise involves an application of the calculus through substituting other words for "study, "continuous", "function", "following", "development", "history", "indefinitely small steps"--then making new sentences with these to arrive at one's own ways of wording the 'definition'. For instance, we might get: "The investigation of an ongoing situation by closely observing how it is changing…and changing through the changes we have introduced." In everyday situations, especially when-where we find ourselves in unfamiliar places, unusual situations, learning to do something, and so on, we are applying bits of 'the calculus' without being aware of so doing. (Using general semantics principles, we could train ourselves so to do.) In these situations, more than usual, we are generally involved in studying and observing; we are usually more cautious, and tend to take "very small 'steps". It was from my own experience parking my car in an underground garage, that I suddenly had an unforgettable "aha" experience: For several weeks, I was puzzling over the question "What could the calculus, a mathematical discipline, have to do with everyday living?" In noticing what I was doing in parking the car, I suddenly became aware of a link…a connection between words of the definition, and the process called "parking"...I happened to notice that I was frequently observing and checking the position of the car and other nearby objects (cars, garbage containers, concrete columns, and so on. And I also noticed, and was aware of noticing, changes in the positions of the car related to (a function of) corrections I had made. I was aware that I was aware that I was following my actions very closely and taking very small steps

with the steering wheel, the breaks, and the gas pedal to avoid things. Then I actually felt a jolt in my head! I recognized that I was involved in "studying a continuous (ongoing) function (parking)" and following its development through very small steps. In all this, I also became aware that I had shifted from a verbal understanding to an experiential structural understanding. That one experience was the start of a deeper understanding of the general semantics emphasis on "consciousness of abstracting" and other principles. I recognized that all the observations, actions, thoughts, and awareness of what I was doing were examples of "abstracting", "mapping" and "taking a objectifying-structural approach"…This structural approach involves thinking of thoughts, words, symbols, definitions, ideas, theories, explanations, opinions, etc., as maps--representations, and pointers—to the extent that they were about things, they could not be the same as the things-situations-happenings they were about. I began to see a close connection between 'the calculus' and the general semantics principle "consciousness of abstracting". And based on this connection, following Korzybski, I also began to think of the calculus as more than a mathematical and scientific tool, but also a psychological and self-development tool. If we think of our living at psycho-physiological levels as continuous abstractions, the general semantics principle "consciousness of abstracting" can be thought of as another way of restating the definition of the calculus. "Consciousness of abstracting" can be thought of as another way of saying "Follow the continuous functions (we call imagining, thinking, sensing, believing, evaluating, acting-reacting (behaving), etc.) through very small steps…recognizing that steps have been left out—both in the inner processes, and from whatever they are about."

Over the years, this structural approach has been popularized: "The map is not the territory" ('thing', situation, happening, person/s, etc.) it is a map of". And "The word is not the 'thing' it is about. These words of wisdom have been criticized by some as 'simplistic', 'childish', and 'everybody knows that'. But not many thought of their criticisms as not being the same as what they were about. Not many went on to apply the principle to their easy acceptance of the words of advertisements and promises of politicians…examples of the power

words automatically have over us when we do not follow our continuous evaluating operations and use our structurally discriminating power over words—how they influence our thoughts, attitudes, and actions.

General Semantics, being about "our human evaluations-and our language based individual-'tribal' (national) interactions over times, can be thought of as a "meta-anthropology, meta-epistemology, meta-psychology, and a meta-linguistic system. Korzybski especially emphasized the importance of becoming attentive to how we use words so we can minimize the ways words use us. In "Science And Sanity", page 59, he wrote: "To achieve adjustment and sanity and the conditions which follow from them, we must study structural characteristics of this world *first* , and then only, build languages of similar structure, instead of habitually ascribing to the world the primitive structure of our language." The 'definition' of the calculus, and the principles of "general semantics" offer "a structural, extensional, objectifying, time-binding, general approach to problem analysis, problem solving, self-development, and improving international relationships." With a "structural extensional approach" we give more importance to structures-operations that words are about, than the higher (intensional) significance we usually give to words. ("Objectifying" involves making what we do and how we do, the object of our attention.) Without this objectifying awareness, without being aware of what we are doing and how, we cannot consciously change, abandon, learn from, and time-bindingly improve our ways. (Korzybski labelled this "conscious awareness" of our natural time-binding abilities involving learning from and improving what we have ourselves produced, and what present and passed others have produced, "conscious time-binding"…this towards developing time-binding excellence and a time-binding ethics.) (See "Manhood of Humanity", pages xliii and 241.) Through natural time-binding, we build better bombs and missiles. "With consciousness of abstracting applied to our natural time-binding behaviours, we recognize both the creative and destructive aspects of this natural ability." The words "taking very small step" and "study" can be related to the general semantics principles of "consciousness of abstracting", non-allness" and "non-identity". When we are conscious of abstracting, we are

aware that whatever we think-feel, say, understand, believe, know about anyone or anything, the meanings we give, etc., does not include all (principle of non-allness)…and since we have left out many increments of information, what we think, say, know, etc., cannot be the same (non-identity) as the things, situations, happenings, etc., these words and thoughts are about.

Seems commonsensical and simplistic…yet most of our human problems at personal levels are functions of (related to) our ignorance of, and failure to apply these principles in our individual interactions, approach to resolving conflicts, to the decisions we make, etc., and social, national, and international levels, involving laws, regulations, etc. The applications of the calculus range from the very large to the very small. The calculus as it involves accurate mapping, measurement, and evaluation, can serve as a model and standard for critical thinking. Developing a habit of closely following what we are doing, and taking very small steps in our observations, studies, analysis, etc., of situations lead us to higher levels of evaluation of our own behaviours and other goings on (continuous functions). From a calculus-conscious of abstracting approach, we start to 'look at ' and 'see' our explanations and the meanings we give, our opinions the things we do, and how we do, etc., as functions of (related to) our values, our beliefs, observations, and vice versa. Individually, we are organisms as wholes, not separate bits as our words might lead us to such elementalistic thinking. ("Elementalistic thinking and behaviour" involves verbally, conceptually, and behaviourally separating what is actually not separate". (Science And Sanity, pages 9, 101)

A vocabulary of the calculus includes "differentiation, anti-differentiation, integration, derivatives, variables, functions, structure, limits, boundaries, continuity, time-space-movement, change, rate of change, relationships, changing relationships, instantaneity, differences, making distinctions, mapping, maximum and minimum values, sum, increments, and others." With persistence in following-studying the continuous function "ourselves"--our history-our thoughts-feelings-beliefs-giving meanings-values-relationships with words-actions-reactions-hopes-concerns- fears-etc.; in enriching our vocabulary and going beyond words and definitions of the calculus (and in general) anything,

we will very likely discover and appreciate the calculus, and general semantics (a derivative of the calculus), as superb self-development tools we can use to advance our efforts to make sense of things, and a way to improve ourselves, our relationships, and our ways of being in the world. Using the calculus as a powerful psychological self-development tool can help us improve the ways we 'see', think -feel about and understand things. With practice, much practice, we develop higher levels of attentiveness, and a more finely tuned awareness of what's going on in and around us. With a calculus approach, making finer observations and finer distinctions, we gain more increments of information to modify and make more inclusive, the ways we think about 'things' (including ourselves). With more increments of information, we have the potential to make more accurate maps of goings on in our personal lives, and in our social and international world. With more accurate maps, we have the potential to achieve higher levels of understanding through noticing patterns, and how things are similar, different, and related. The more accurate bits of information we have, the more skills we develop in recognizing and dealing with our own biases, prejudices, conflicts, and disagreements… the more effective we will be in our understanding of, and navigation of the diverse, and multi-structured territories of the ongoing functions we call human relationships, and human behaviours. "Generalized calculus" involving thinking about, and modifying our behaviour based on variables, limits, functions, differentiating, integrating, etc., is a way to help ourselves improve our thinking and critical reasoning skills.

Practicing a calculus approach is a way to expand the range of our consciousness towards achieving higher levels of differentiation (seeing things from a 'higher' (more inclusive perspective and integration). Adopting a calculus approach helps us anticipate developments (what Bernard J.F. Lonergan, S.J. labelled "emergent probability" ("Insight, page 126). With a calculus approach we develop a greater appreciation of the continuous function we call "humanity"--its history (as accounts of things that happened, things 'we' (as humans) did, and our development as functions of our history). In expanding the range of our consciousness we expand our horizons (our worldviews, our

understanding of ourselves, the range of our interests, our field of vision of what's going on in our inner world—including what goes on in our inner world about goings on in the world outside our heads…and more.) (Read "Lonergan's "Insight. A Study of Human Understanding"", chapters on "Common Sense And It's Subject", and "Common Sense as Object".) With a bow to Alfred Korzybski, "the calculus, sanity, and consciousness of abstracting" are closely related. The more we 'know', the more we come to realize how much we do not know. The more increments of information we have the higher the possibility that we will realize that in our 'doings', we cannot avoid selecting-leaving out. If we think of "sanity" as a function of the accuracy of the judgments we make—functions of the accuracy of the information we have (among other factors), we can easily make connections between the calculus, consciousness of abstracting, science, and sanity. If the continuous function we follow (study) is our own ways of being (the way we talk and feel about thing, what we believe, the values we hold, the things we do and how we do; our interests and concerns, our thoughts and feelings, etc.), we provide ourselves with opportunities (like scientists) to engage in conscious time-binding revisions and refinements—commonly referred to as "self-development". If we apply a calculus approach to study and understand our human relationships (at personal, social, and international levels), we will find that to a great extent, our problems are continuous functions of our values, beliefs, meanings we give, expectations, and especially our language habits (our ways with words). Briefly put: we come to recognize that, and how "Most of our problems are our own creations".

Differentiation and anti-differentiation generalized

We can think of our brain-minds as natural differentiating, integrating, and anti-differentiating, map-making psychobiological systems (among other operations). From our observations, wonder, curiosity, we have to varying degrees, a time-binding need to make sense of things, know about, know more, and know better. Without the rigor of mathematics, the specificity of numbers, knowledge of the terms and the ideas of variables, functions, limits, etc. as guides, we do not do as well as we could. In everyday situations, we can "think of "differentiating", metaphorically, as looking ahead" (contemplating

possibilities, what is likely to happen from changes we introduce)). And we can "think of "anti-differentiating" as 'looking for possible contributing factors related to present situations (labelled "causes"). (Mathematicians think of differentiating and anti-differentiating as the reverse of each other.) In terms of conscious time-binding towards progress, both are important. We are engaged in differentiating (looking ahead) when we anticipate possible developments from pursuing a certain plan of action or acting on a decision, and when we anticipate changes from changes we have introduced. When we contemplate (engage in studies related to) the potential consequences of our actions, we are in effect differentiating. We ask "What changes, what can I expect, what is likely to happen, what are some possible outcomes from the changes, decisions, actions taken, and so on. We are engaged in differentiating when we anticipate or measure "changes in blood pressure or heart rate, related to (as a function of) increase physical activity" (cbp=f(ipa). In everyday anti-differentiating, we "start from a given"--a puzzling situation, a problem, etc., and seek to uncover contributing factors. We seek explanations: We ask "How did this happen? In effect we are asking "What is this (situation, problem, happening, etc. related to (a function of)?" (Think of the very fine steps investigators take in their rigorous studies and research to uncover possible contributing factors (variables, 'causes', conditions, etc.) related to an unfortunate plane crash, in order to introduce life saving changes.) Following "Descartes", we can think of anti-differentiating as "breaking down complex problems and situations into smaller, more manageable bits".

Science (involving observation, curiosity, insights, hypotheses, experiments, theories, predictions, and refinement of theories, and ongoing successes in this approach), can be taken as an excellent example and model of differentiating and anti-differentiating. (We do all this in our everyday situations…but not with the same rigour applied by scientists…who in their 'scientizing' are especially more careful with words.) Scientists advance not through guessing and declaring what things are, but through mathematics, how they operate and interrelate: Through rigorous studies involving anti-differentiations, and differentiations, studies of continuous functions involving physical relationships, they search to

uncover the "structural make-up and operations of things". They create theories (differentiating)—propositions related to possible developments, and consequences related to changes observed in goings on. As novice scientists in everyday experiments in living, when we can contemplate (study) the potential consequences of our actions; when we anticipate possible developments from pursuing a certain plan of action; when we anticipate changes from changes we have introduced, we are in effect differentiating (predicting). Like scientists, we also notice things; we observe, wonder, hypothesise, 'experiment' (we say "try and let's see"); we make 'theories', and 'predict' (opinions and expectations). As novice scientists, through our experiences—when things don't work, we sometimes refine our theories (we change our minds, our opinions, and ideas, our expectations; we sometimes abandon our beliefs and values). (Please note: these are just pointers, simple examples of the many ways we are engaged in differentiating and anti-differentiating. Endeavour to catch yourself so engaged.) Our principles, ideas, insights, theories, explanations, opinions, philosophies, psychologies, speculations, histories, sciences, mathematics, religions, imaginings, works of art, cultures, societies, and nations, etc., are all products of (functions of) our natural differentiating and anti-differentiating abilities. Thinking in term of anti-differentiation is one way to approach the question "Who am I?" Breaking down the continuous function represented by the little symbol "I" into smaller bits, and treating "I" as a variable in time: "I" represents the 'sum' of, the function of, the integration of, the derivative of, the incorporation of all the thoughts, feelings, ideas, imaginings, dreams, beliefs, values, hopes, concerns, fears, interests, insights, experiences, things I have done, pleasures I have experienced, and presently might have forgotten etc. The symbol "I" could be considered as representing instances, time-increments of the continuous function of time constituting my existence from birth to present moment. As such, "I" at time (1), is not identical (not the same in all respects as "I" at time (2). In effect when we say "I" we could be more accurate by indexing "I", with the thought: "as a label for a present representation of a map of myselves" (Clumsy? Yes… but probably a more accurate statement minimizing confusions arising from the concern: "Who am I?")

Re. ”Variable”

Think of variable as a symbol which can represent any one of a set of values. Anything can be considered a symbol. It can represent different values, at different times for different individuals. We live in a world of variables and change...things changing (including ourselves), and changes changing. We can think of ourselves as variables: At any time, we constitute symbols--representations of one of the many ways we can be. We are not the same we were at birth. We are not the same from day to day: Our moods, feelings, concerns, interests, etc., varies. Our ways of relating varies: We give our different ‘values’ and meanings (useful, important, dangerous, beautiful, unsightly, desirable, etc.). We can think of things as variables...functions of time…they change. At any moment, a thing, object, etc. exists as one of the many ways it will be. We can think of most words and names as “semantic variables”: They represent things (physical and imaginary)--that might no longer exist, or have changed significantly. From our different experiences, training, etc., we each give our own ‘values’ (meanings, significance, importance, etc.) to words we utter, read or hear. (This is a source of much conflict and misunderstandings when we forget that words as variables do not have meanings--that meanings we give are functions of our individual interpretations and ‘values’ we give based on our unique experiences.)

We, others, things, groups, societies, nations, etc., change, but sometimes, not thinking in terms of variables, we continue to refer to them, react, and treat them based on their names. Thinking in terms of variables, and appreciating a world of change, we are less disappointed, less dissatisfied, less confused. We reduce the severity of shocks to our nervous systems resulting from changes, disappointments, and dissatisfactions. From the perspective of “variable”: words we label “fake news” can also be valued as “important news”...not news in the usual sense of “words representing reasonably accurate report of an event or happening”…but the words as the event, the happening, an actual occurrence, a variable that can be given many values, and a variable

representing one of the many ways of human interactions. It suits us to think of words labelled "fake news" as an actual happening, a goings on that is to our advantage to recognize as instances of human behaviour. And a reminder to be attentive to the meanings we give to what we read and hear...no matter the source.

On functions: If we think of the world as a multi-valued continuous function of time, the calculus generalized (no numbers, equations, etc.) can be thought of as "a general approach to "problem-solving", "mind expanding", a cognitive slowing down and discrete way of dealing with movements, speed, change, limits, continuity, etc. The calculus can be applied to our understanding of the very large and the very small. Applying the calculus is way to structure our evaluations and judgments in order to facilitate our understanding of many 'things', situations, and relationships. Anything that exists can be thought of as a continuous function that we can study (map, represent, understand) to varying degrees of rigour). Keeping the words "study", "mapping to varying degrees of rigour" in mind helps us to understand and avoid many personal, social, national, and international problems. The notion of functions generalized is about links, connectedness, dependency, correlations, relatedness, etc.

Thinking in terms of continuous functions involves thinking in terms of relationships and changing relationships: how somethings (including what we say, think, believe, do, etc.), are related to, or is changing in relationship with how some other things have changed or is changing etc. If we accept that we live in a world where as far as we know everything is in relationships, thinking, reasoning, talking, modified in terms of functions, variables, limits, continuity, relationships, consciousness of abstracting, non-identity, and non-allness, can be considered as "advanced thinking"—a shift from our usual ways of thinking towards thinking that is more accurately representative of goings on. From a general semantics perspective: We are on saner semantic grounds when we develop a functional differentiating and anti-differentiating approach to modify our usual hasty semantic reactions (judgments, decisions, conclusions, meanings, beliefs, feelings about some one, some thing, situation, etc…but in terms of "non-allness", we should remember that there are times when hasty

reactions make good sense. Human behaviours are functions of human natures: Yet dictators, leaders, rulers, politicians, and many in charge of human affairs pay scant attention to this simple, but very important for better human relationships. Laws , rules, regulations, policies, etc., are in effect restraints on the other wise 'free' expressions of human natures. As such it makes sense to think of politics as an unrecognized an unexplored branch of human psychology. It is predictable that governance or dictatorships that ignore human natures will eventually lead to rebellions. More and more humans are becoming dissatisfied with being ruled. More and more are seeking more participation. There are limits to how much abuses people will suffer.

Thinking in terms of continuous function, we might modify our notion of "the past", "the present", and "the future" towards more accurate representations. In actuality, there are no gaps…no markers informing us that "the past stopped here, the present starts over there, the future not here yet. Time does not stop and start. (See "A structuring of the Notion of Time:" at <miltondawes.com>) Applying the notion of "function", and with careful study, we might come to appreciate the 'present' as a function of the 'past', and the 'future' a function of "the present" and "the past". What we label "the present" is a continuation of--constitutes the effects of what we label "the past". And what we label "the future" is a continuation with modifications, of what we label "the past" and the present. As such, we can say 'the future' started long ago: This might be criticized as being academic, or mystic…but imagine living in a world where the 'nasties' had won the second world war! In not linking what we call "the past, "the present|" and "the future"; in not thinking in terms of "continous function", we are likely to forget "goings on-and their effects (an example of what in the field of general semantics is labelled "elementalisic thinking" (verbally and non-consciously separating what actually is not separate). If as individuals we accept that what we do, how we do what we do (our beliefs, judgments, values, the quality of our personal relationships, the institutions we help create, and so on) are functions of the ways we use words, we might be more concerned regarding the usual ways we think of the words "the past", "the present", and "the future". Thinking of 'the future' as a function of 'the

present' and 'the past', we each might give some thoughts to what we are doing 'now' as a foundation of our own 'future'. We disadvantage ourselves when we elementalistically (disconnect) think and talk of a continuous functions (earlier-present-ongoing developments) as if they were distinct times named "the past", "the present', and 'the future'. I have heard the following a few times: "That's in the past; That's it. Time to move on" (exact words). Instead of the words "moving forward" we (as individuals, groups, institutions, nations) could indulge in some differentiating and "conscious time-binding": We could recognize changes we make as creating foundations for things to come?"

As time-binders, as we are functions of ourselves, each other, our environments, our history, our language, our beliefs, and time. How we are being at time (2) is a function of how we were at time (1). Our experiences are functions of what we bring to situations. (This is not new: The wording represents another way of saying what was said many centuries ago: "Whatever is received is received in the mode of the receiver"…and from quantum theories, I add "and their tools". As functions of ourselves, we could theorise that "what comes up at psychological levels is a function of goings on at unconscious neurological levels". As functions of ourselves, in our relationships with ourselves, we call on psychotherapists for help when we do not find our relationships with ourselves and with others, a satisfying one. We are functions of our societies and our societies are functions of us. We create societies and we are the foster children of societies. The quality (well being and welfare) of a society is a function of the relationships between people, and their leaders and rulers. The success of science and mathematics is a function of the degree of rigour and ongoing refinement they bring to their studies. We could think of "religions" as functions of fears, arising from a need to know about origins, meanings, and values. (In applying functions as behavioural modifier, it's important to keep reminding ourselves that in a world of relationships, saying "A" is a function of "B" does not mean that "A" is only a function of "B" and nothing else.) Thinking in terms of functions, we avoid "one cause one effect", either/or,"it's because", "why", "it can only mean", "it has to be", "it must be so", etc. (a not always appropriate "one valued and two valued thinking".) In

the realm of politics: "The probability of chaos, disorder, and rebellions", are functions of (relationships between) freedom (f), and restraints (r): "C,D,R, = f(f - r)": In dictatorships for instance: The probability of rebellion and disorder increases as restraints to freedom (laws, rules regulations, use of force, etc.) increase beyond the limits of human endurance. Too many laws and regulations discourage and restrain curiosity and imagination and eventually results in rebellions: but too much freedom and insufficient restraint as in 'democracies' ("I do my thing") increases conflicts and also eventually leads to social disorder. In a world where as far as we know everything is in relationships: "a functional conscious time-binding approach" makes good sense. A challenge for us (humans) involves exploring ways towards finding acceptable balance between individual freedom and social responsibility ('democracies'), and forceful restraints as in dictatorships, and authoritarian regimes.

From Korzybski's "organism as a whole-in environments" principle: Thinking-feelings-believing-speaking-values, behaviour, etc. are psycho-biologically related functions of each other: Changing anyone will result in some degree of changes in the others, and differentiating: strong natural resistance can be expected when there is any attempt to change any member of the set. Our survival as a species is a many valued function of our human ways-- including our values, beliefs, actions and interactions (friendly, aggressive, etc.), our history, time-and-space. Our biases, prejudices, judgments, values , expectations, beliefs, knowledge, understanding, theories, opinions, explanations, feelings, insights, etc., are all related to, all dependent on, all linked to (all functions of) the amount and accuracy, how up-to-date, and how credible the source of the information we have, among other factors (other variables). In a world where as far as we know "everything is in relationships", we could assume that to some degree, everything is a function of time-space and other things. The human world is a subset of, and a function of Universe: as such, for the quality of our living (manageable stress, conflicts, minimum confusion, our abilities to cope with what we are given, experiencing satisfying relationships, etc.), it suits us to know more about (especially through applying a scientific approach) many of the ways Universe works. A scientific, calculus,

general semantics approach can help us gain a structural (non-mythical) understanding of how things are interrelated. Understanding structure-functions of Universe outside our heads, is a way to understand that part of Universe we call "ourselves".

As functions of ourselves and Universe, the life we create for ourselves is a many valued function of our physical, social (neuro-semantic-and neuro-linguistic environments), our experiences, thoughts, beliefs, values, fears, interests, concerns, the range of our vocabulary and the ways we use words (or let words use us), our habits, etc. (Re. "neuro-semantic, and neuro-linguistic environments ": We live in societies (environments) built and operating based mainly on words: "Neuro-linguistic" a label for a recognition of words as creations of human nervous systems, and vice versa… think of the internet, think of politics. Words create inner and outer environments as powerful in their effects, as our physical environment. "Neuro-semantic environment" has to do with the social neuro-linguistic environments built from the meanings, values, beliefs, behaviours, history, etc, related to the use and interpretations of words.) As Lonergan framed it: 'We live in a world mediated by meaning" (Insight, page 238). As such we can say we live in the same cosmic world, but to some extent, in terms of our diverse meanings, beliefs, values, interests, concerns, etc, we live in different "neuro-linguistic and neuro-semantic, mediated by meanings" worlds. A lack of awareness of these factors, leading to poor understanding and adjustments, is a source of much of our human conflicts and problems at personal, social, and international levels. Briefly put: Many of our problems can be considered as derivatives of our poor level of understanding, and poor level of knowledge of ourselves...and of our human natures. The degree of our coping skills is a function of the tools we have. A calculus approach, including thinking in term of functions, variables, limits, etc. provides powerful tools we can use to develop, expand, and improve our thinking, reasoning, and coping skills. Readers can have some fun playing "the game of functions": My health is a function of…; the quality of my relationships is a function of…; good, satisfying international relationships, the welfare of the

human world is a function of…: Keep in mind that the answers that come up are "not all" the answers possible.

On "Limits"

In a world of relationships, things limit each other. The earth's movement is limited by the sun's gravitational field. The Universe is full of different kinds of fields. Except for time-and-space, everyone and everything in Universe has limits...as far as we know. Mountains will bear only so much volcanic pressure before they explode. Fishes will take only so much pollution—more and they die. Machines breakdown when they are operated beyond their designed limits. As psychological-bio-physical-spiritual organisms, there are limits to how much our nervous systems can endure from overwork before we suffer psychological, biological, and spiritual breakdowns. There are limits to our ability to manage complexity: When we ignore this, and elementalistically forget that world situations are also a function of our actions, we usually take actions that create more complexity. Rebellions, uprisings, revolts, can be considered as recurring functions of those who set limits for others (laws, rules, regulations, etc.), while ignoring the importance of setting their own limits. It's possible there is a limit to how much people the earth can support. Thinking of limits as having to do with "that which we cannot go beyond or supersede": A proposition" The general semantics principles "consciousness of abstracting, non-identity, non-allness, and non-elementalism'' as "critical thinking standards", determine the limits of human intelligence, and understanding". (See page 3)

Let's explore (study) the notion of "the truth" from the perspective of limits. And let's define "the truth" as "a declaration", words representing a belief pertaining to all that's the case about something". And let's make a distinction between "a true statement" (I am presently composing an essay), and "a statement offered as "the truth". If there are limits to our sensing, we can assume there are also limits to our knowing, understanding, and meanings we give-- As such, we cannot know all about anything—including "the truth"(as defined) about anything. We could think of our notion of truth in terms of evaluations, and judgments, approaching a limit set by the boundaries of our

sensing. As such, "We cannot tell the truth, whole truth, and nothing but the truth about anything" (including ourselves): There will be a great deal of increments of information missing from our telling. If we think of a "truth" declared as a function of (related to) a judgment verbally expressed, and a value we give to that judgment…and if our judgment is a function of our knowledge; and our knowledge a function of our sensual and cognitional mapping; and our sensual and cognitional maps are limited in information—(maps have less information than the territories they are maps of)--We can reasonably assume that "the number of increments of information we have about anything will be less than the number of bits of information that constitute that thing": Consequently, we might consider our notion of "the truth" as an ideal—a limit approached by the totality of information constituting a collection…a set of all the true statements about something we can approach--but not produce." From quantum theory, results we get, our conclusions, have to include effects of the tools we use on whatever we are investigating. And we (our approach, our thinking, our experiments, our methods, our definitions, etc.), are included in the tools we bring to our investigations. As such: What we declare as "the truth" will be a more accurate as stated as a probability. Of course, all the above is a function of the way "the truth" has been 'defined'. And since that's not the only possible definition, there is a possibility of conflicts. Conflicts can be addressed as a start, by applying the general semantics principles of "non-allness " and "non-identity": We cannot know all about anything, and what we know is not identical with that which is known about. Any truth declared can be considered a map, a function of our observations, interpretations, knowledge, understanding, beliefs, etc. (all maps). A question may arise: "If all we have are maps of maps of maps…What's real?" One answer: "A map of anything presumes that there is something being mapped (imagined or observed)…A way to expand the philosophic "notion of objectivity" (which "btw" does not include a subject).

Maintaining a satisfying relationship with anyone or anything is a function of, depends on, is related to one's acknowledgment of, sensitivity to, appreciation of, timely adjustments to limits." It suits us as individuals and as a race to start

recognizing that there are limits to our ability to cope with, deal with, and satisfactorily manage the speed, number, and complexities of the social, economic, political, technological, and other structures-operations we continue to create. In terms of increasing numbers of complexities, and our limits, the later we start the worse off we will be. A proposition: If as individuals we are concerned to behave more intelligently; if we were to create a map of humans racing towards sanity: "A calculus-conscious of abstracting-scientific approach" will provide an invaluable tool."

(The above represents a verbal mapping of what I presently understand about the calculus...a very gross (untutored) map...but one which I have found quite useful in its applicability to everyday situations and understanding our human situations. Similar to my efforts to make some sense of the definition of the calculus; and since there are many unfamiliar words and phrases in this essay, readers are invited to look for actual examples and experiences related to these words--towards an appreciation of the calculus-and general semantics as a powerful approach to making sense of things.

Milton Dawes/18

References.

Science and Sanity. Alfred Korzybski. Fifth Edition. Institute Of General Semantics. Englewood, New Jersey, U.S.A.

A Tour of The Calculus. David Berlinski: Vintage Books. A Division of Random, Inc. House. New York.

Insight. A Study of Human Understanding. Bernard J.F. Lonergan, S.J. Third Edition. Philosophical Library. New York.

Mathematics A Cultural Approach. Morris Kline. New York Wesley Publishing Company, Inc. Reading, Massuchusetts. Palo Alto. London

And many other time-binders too numerous to mention.