Institute for Christian Learning
Education Department of Seventh-day Adventists

GOD IN NATURE:
REVELATIONS OF THE DIVINE MATHEMATICIAN

by

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INTRODUCTION

In presenting this paper I have assumed that, as Christian educators, we have a Christ-centered world view and as such clearly see the need for the integration of faith and learning in the classroom.

When we teach students mathematics, it is expected that they will develop; an awareness of the order, logic and precision that are characteristic of the Creator; a growing knowledge of God's faithfulness and dependability; and the skills of logical thinking and presentation. We also find it essential to instill in them an awareness of consequences, potential, balance, caution, choice, learning from mistakes, order, awe, informed decision making, logic, following instructions, adherence to principles, sharing, stewardship, appreciation of the Master Designer, reasoning processes, discipline, perceptiveness, creativity, dependability, and personal responsibility. (Hill, 1990)

However, many teachers of mathematics find it challenging to properly integrate faith and learning in their classroom. The method of parallelism is the one most often employed by those who realize the need to portray values in their delivery.

This paper presents a mathematical model of **creation, deterioration** and **restoration** as a starting point for the teacher. Throughout, mathematical applications have been used to help illustrate the processes by which God makes Himself known to us - His principles, His judgements, His all-sustaining power and His constant connection to help better mankind. Students as well as teachers are involved in the natural processes of creation and as such should be able to relate to the examples presented.

> If properly approached, the study of nature may...penetrate the devastating problem of sin and God's redeeming grace and...lead to a clearer understanding of the laws and operations of nature, the laws that operate in human life and the great principles of truth that govern the spiritual universe. (Taylor, 2CC)

Recently, students of mine, in Precalculus I, were given a group project in which they were required to show evidences of mathematics in nature. They were to present in pictorial or graphical format, ten (10) examples. If the picture or graph was not self-explanatory, then they would have one paragraph to explain what concept they were presenting. Out of those projects, I have chosen several to present in this paper to show how these students gained insight into a orderly, logical, caring and loving Father/Creator. *(Teacher explanations are provided in the appendix – page 13 ff)*

THE BASE

In working problems in mathematics students are often faced with the dilemma of not knowing what to do first. To many the saying, "Fools rush in where angels fear to tread" (anon) becomes a personal reality. One of the most famous mathematicians of this century was George Polya, late Professor of Mathematics at Stanford University. His discoveries have included the areas of real and complex analysis, probability, combinatorics, number theory and geometry. His publications exude such clarity and elegance that they are a joy to read. (Smith, 1987)

Polya in 1945, developed a model for problem solving which he later published in his book *How to Solve It.* This classic points out four main steps to use; **Understand the problem, Devise a plan, Carry out the plan, Look back** (examine the solution obtained). To complete this book of mathematical strategies, Polya includes many problems worked out with his basic four-step model as well as history and good advice. Modern day mathematicians still find this book indispensable.

God the Creator, a Mathematician, who impressed Polya to "discover" these procedures that would help humans in their reasoning and implementation of mathematical principles, had been applying them before Polya was born. The crucial difference between the man who presented us with this approach and an omniscient God, is that the Divine Mathematician knows the problems that will occur and has already devised plans to solve them.

CREATION

Evidences of Order and Structure

"The earth was without form and void; and darkness was on the face of the deep" (Gen 1:2) clearly indicated that there was a problem to be solved. In looking at the work of the Creator, we observe a carefully sequenced order of events used to solve this challenging phenomenon. He devised a plan and carried out the plan. The sequence or order of working out a problem has to be carefully thought out and analyzed before conclusions can be drawn. Each part of a problem depends on the "conclusion" or "creation" of the previous step. You must know the first term, the last term and the difference between each term in order to obtain a desired arithmetic sequence. Follow the sequence that was implemented to answer the barrenness of earth.

Sequencing - On day one, day and night were brought into being; on day two, the firmament; on day three, the earth and seas, grass, plants bearing seed and trees bearing fruit. On the fourth day, the creation of sun, moon and stars took place; on the fifth day, the fish and birds. On the sixth day, He created the cattle, creeping things, beasts of the

earth and man and woman. On the seventh day, the Creator rested - thus setting an example for us of cyclic behaviors. (Gen 1:3 - Gen 2:3)

Each successive day's creation depended on what had been done before. It would have been a chaotic condition if the fish were created before the waters were separated, or man created before the dry land was put in place.

Categorization - God divided His creation into categories - the fish, the birds, the firmament, the light, the beasts, man and woman. These divisions that may have seemed haphazard made it remarkably easy for Noah to execute the command from God to have the animals enter the ark, in pairs, each after its kind (Gen 6:19,20). The distinction had been laid out from the beginning.

Shape and Form - The shape and form of each animal, plant, being, was to fit them for the role they were to play in occupying, enjoying, nurturing and replenishing the earth. Some were made to creep, some to walk on all fours or eights, some to fly, some to swim, others to hop, and man was made to walk on two feet. The form of each creature lent itself to it's mode of transportation, reproduction, identification, survival and overall well-being on the earth. Each was in tune with the other and helped to make the quality of life perfect.

Mathematical Exactitudes

CONSTANCY

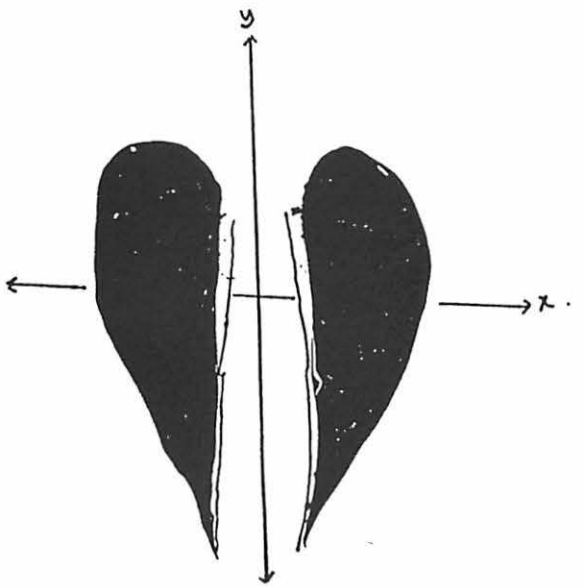
"Kinds" - Being constant implies remaining the same; never changing; keeping the same value - a principle established from creation by a God who also placed in man the desire to "consolidate the bewildering variety presented by his environment into an orderly pattern". Man has "the urge to classify, to create order from disorder, and on this to base ideas and conclusions of a general nature ..." (Guyer & Lane, 1964)

Sexuality/Gender - It began in the Garden of Eden when the methodical God of systems and patterns instilled in Adam the ability to identify the various categories of plants, birds, sea creatures, et cetera and thus he named each creature. He gave names to the cattle, to the birds and to the beasts and to his mate (Gen 2:20). It is not clear what criteria Adam used in naming these other occupants of Eden but he declared "This is now bone of my bones and flesh of my flesh; She shall be called Woman, because she was taken out of Man" to clearly define that he recognized his counterpart.

The species placed on this earth by the Creator still exhibit the general characteristics with which they were created. Regardless of the movement to occupy the earth, human beings still have the same basic form. Though the offsprings of creation may differ in color, in height, in build, in size – a man is still a man and a woman is still a woman; birds still fly, fish still swim, insects crawl and/or fly, beasts of the field still graze, etc. Though each

specie may have had to adapt to its environment, they continue to reproduce and each successive generation exhibits similar attributes to that of their predecessors.

Axis & Balance - Division of the body in half, length-wise, show that man/woman is in balance (for the most part) on both sides of his/her body. If this line of demarcation is looked at as the y-axis, it can be seen that man/woman was created in perfect bilateral symmetry. That is, the line would represent a mirror from which the image was the same distance as the reflection in it.



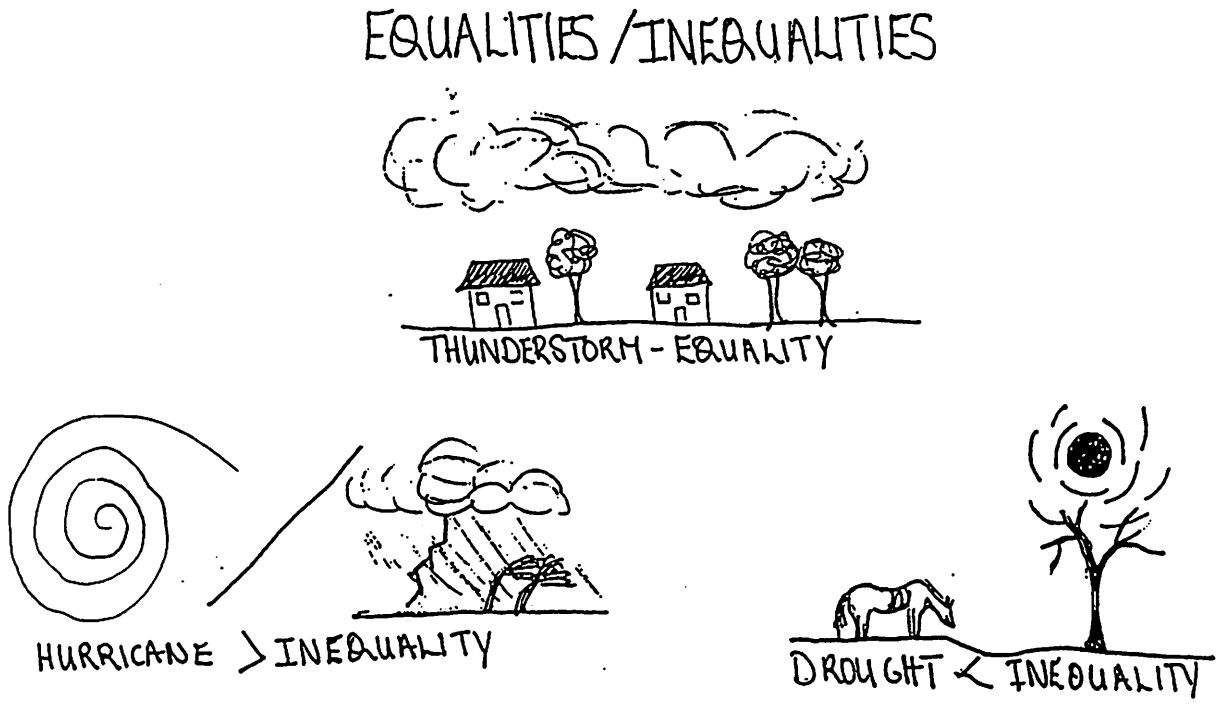
Symmetry in the y-axis

This principle also applies to the rest of creation. In some instances, the reflection phenomena is much more extensive and can therefore be viewed as being symmetric to the origin, as in the case of a starfish. {If the center of the starfish is established, then any point or appendage has its match on the opposite side, and a straight line, through the origin, can be used to connect them.}

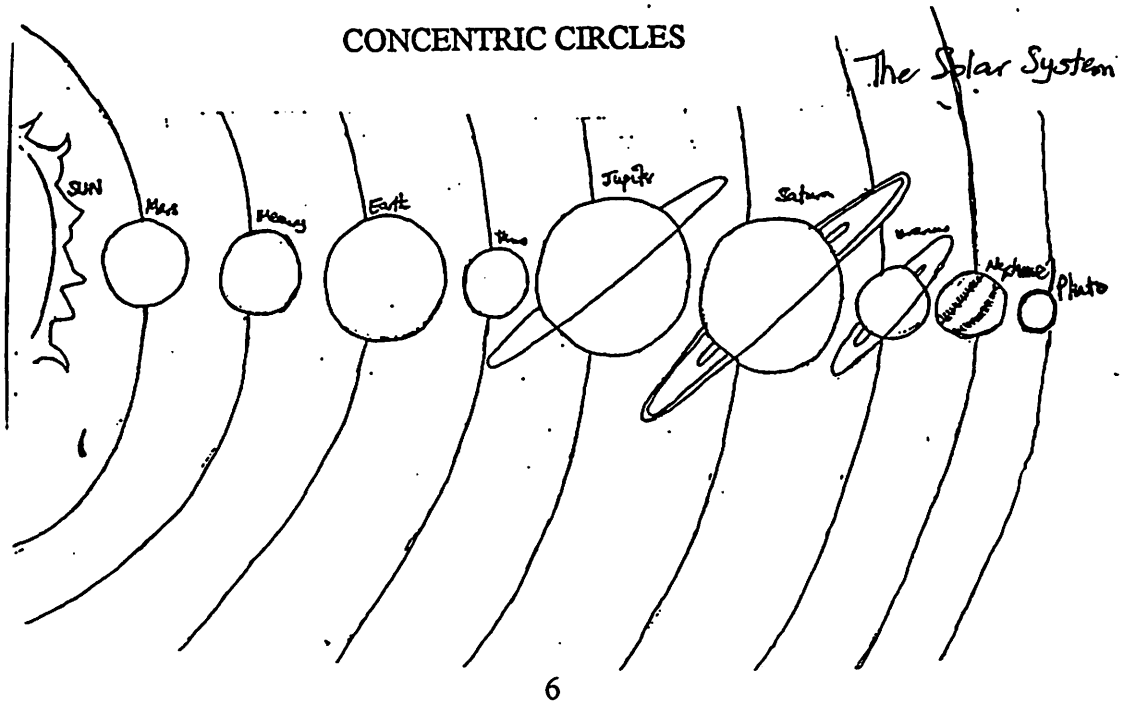
PRECISION

Ecological Balance - Balance must be maintained between two sides of an equation. Addition or subtraction of a variable on one side of the equation, has its correlation on the other side. Each element of creation contributes to the ecological balance that enables life as we know it, to continue. While man continues in his quest to make a "perfect"

world, he still requires other organisms in his environment in order to maintain balance (equality) and thus ensure his existence and general continuity.



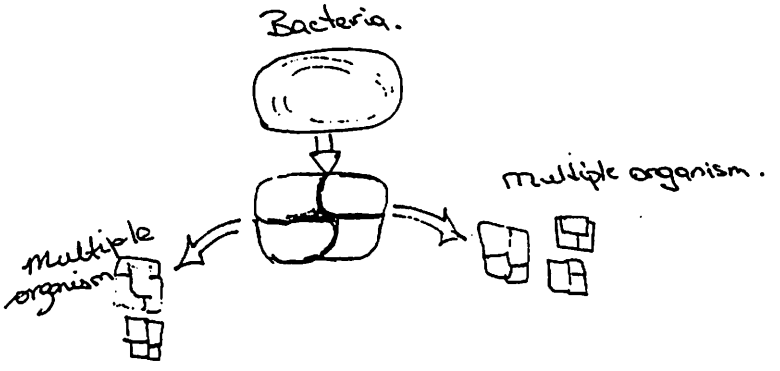
Environmental Effects - The tilt of the earth, a precise angle of refraction, provides for the temperature differences on the earth, the undulating of tides, the patterns of rain, the seasonal changes..... The earth in its orbit around the sun keeps the planet at temperatures that will sustain us.



If moved out of our orbit, or shifted at a greater angle, life could not be the same. Destruction to our earth and its life would be caused by either increasing the temperature too much (if moved closer to the sun) or lowering it too much (if moved further from the sun). The gravitational pull on the earth has allowed us to unfold laws of physics, based on mathematical principles.

Subsets of Life Forms

There is a universal set of God's implementation that has as subsets, the various life forms. On the periphery, there exists viruses and bacteria.



Then we have the species of plants...then animals and finally man. Each of these exists only with the influence of the others. Man who was made "a little lower than the angels" (Heb 2:7) is still dependent on all other life-forms for his existence.

When all was done, before resting on the Sabbath, God implemented the last step, pointed out by Polya, to determine the validity of the conclusion drawn. He looked back and "saw everything that He had made, and indeed it was very good." (Gen 1:31) "Everything was perfect in its kind; every creature met the goal appointed by the Creator, and was equipped to accomplish the purpose for which it was created." (SDA Bible Commentary, Vol 1).

DETERIORATION

Deception by Exclusion

Invalid Assumption - A new "problem" presents itself to the Great Mathematician. Sin enters the world and deterioration of all perfection has begun. According to the rules of logic, the only equivalent and/or valid form of a statement is its contrapositive - not its negation. God said "You shall not eat it, nor shall you touch it, lest you die" (Gen 2:17).

The statement "You will not surely die" (Gen 3:4) , made by the serpent, is not equivalent in meaning. It led to an invalid conclusion/assumption, that is, the negation of the original statement.

Progressive Degeneration - The concepts of permutations are prescribed in mathematics to help in the calculation of the number of events possible in a predescribed situation. The rapid growth of sin took on a momentum that can be likened to an expression whose result approaches infinity.

Adam and Eve ate the forbidden fruit and started the chain reaction. Cain, their son murdered his brother. Cain's great-great-great grandson also murdered a young man though he claimed that it was in self-defense. (Gen 4:8 - 24)

Distortion of Shapes and Forms

Though life forms display characteristics close to those with which they were created, the degenerative effects can be likened to the observations seen in similar triangles. The corresponding angles and sides of each bear the same proportional relationship, but the triangles may be of different sizes. If one compares the height of Adam to present day man, the proportion of approximately 18 ft to 6 ft is a 3 : 1 ratio. "As Adam came forth from the hand of his Creator, he was of noble height, and of beautiful symmetry. He was more than twice as tall as men now living upon the earth, and was well proportioned." (White, 1945)

> If Adam were twelve feet tall or more, he could have weighed nearly a ton. An increase in height of more than two times would increase the weight by more than eight times, because there would be a corresponding increase in girth, as well as height, in order to maintain the same proportions. Adam was a giant....(Coffin, 1969)

"If Adam, at his creation, had not been endowed with twenty times as much vital force as men now have, the race, with their present habits of living...would have become extinct." (White, 1948)

Mankind, who named all created beings, built a tower that was to reach the heavens, used triangulation to mortally wound their enemies and constructed the great pyramids, is today reputed by scientists to use only between five and ten percent of their brain capacity.

Most of the patriarchs from Adam to Noah lived nearly a thousand years and yet since the days of Noah, mankind lives an average of 70 years. Larger animals help to keep the balance of nature by preying on smaller species. Different species have become extinct due to predators, harsh environmental conditions (supernatural or otherwise) or genetic degeneration. All life and capabilities move towards diminution. The ratios show increased disparity as life continues. Ellen White (1968) declares:

> The God of nature is perpetually at work. His infinite power works unseen, but manifestations appear in the effects which the work produces. The same God who guides the planets works in the fruit orchard and in the vegetable garden. He never made a thorn, a thistle, or a tare. These are Satan's work, the result of degeneration, introduced by him among the precious things; but it is through God's immediate agency that every bud bursts into blossom.

Deviation from Point of Contact - Velocities add as vectors. That is, the tail of one is connected to the head of another and the resultant taken. When man sinned, (moved away from his original designation), it was equivalent to a pilot plotting a course, but

forgetting that the direction of the wind can place one in a different location than one charted using only speed of the craft and direction desired.

> The things of nature that we now behold give us but a faint conception of Eden's glory. Sin has marred earth's beauty; on all things may be seen traces of the work of evil. Yet much that is beautiful remains. Nature testifies that One infinite in power, great in goodness, mercy and love, created the earth, and filled it with life and gladness. Even in their blighted state, all things reveal the handiwork of the great Master Artist. Wherever we turn we may hear the voice of God and see evidences of His goodness. (White, 1964)

Though man seems to have forgotten his Creator many times, God was still intervening in the affairs of man and sought to bring him back to his original purpose.

RESTORATION

The Divine Focal Point

Before man sinned, God knew his heart and devised a plan for his redemption. Now He carries out the plan - the plan of restoration.

Mathematicians employ the implication sign when they want to stress why some conclusion can be drawn. God, in His infinite wisdom, didn't imply what man would need. Rather, He gave him a ten-step model, found in Ex. 20: 8 - 11, to point him back to the perfection with which he was created. The paradigm is that all are interwoven. And Jesus, Himself, summarized them into two main responsibilities: love for God and love for humankind. (Matt. 22: 37 - 40)

In linear programming, the function to be maximized (or minimized) is called the object function. Although there are usually infinite solutions to the system of constraints called feasible solutions, the object is to find one solution, the optimum solution, that gives the maximum (or minimum) value of the object function. The system of constraints, represented by linear inequalities, require that all variables be nonnegative. Though there may be many external factors and man is called upon to maximize, subject to personal conditions, two of the inequalities of the lines bounding the feasible region of salvation are already defined. The $y \geq 0$ (vertical line) depicts the "line" defining love for God, and the $x \geq 0$ (horizontal line) depicts the "line" defining love for man. If and only if (IFF) you display love for God and your fellow man (with all its implications), will your optimum solution be found in the feasible region. (Haeussler & Paul, 1993)

In the book *Counsels to Teachers*, E. White states that "...a better than earthly reward awaits those who, basing their work on the solid Rock, build up symmetrical characters, in accordance with the living word.

Based on the axioms, postulates, theorems and previously acquired knowledge, inherent in the study of mathematics, mathematicians can utilize several different routes to solve any given problem. No matter what method is employed, as long as mathematical integrity is maintained, the resultant will be the same. When God put the plan of salvation in place, it was a single imperative. "Nor is there salvation in any other, for there is no other name under heaven given among men by which we must be saved" (Acts 4:12) All have access to it and may adhere to it through different routes and/or avenues, but the plan has meaning only as it is accepted.

Christ died to redeem humankind and thus provide for them the way back to perfection. When the heart and mind are attuned to the love, care and redemptive outreach of God, man will once again, be a reflection of His glory.

CONCLUSION

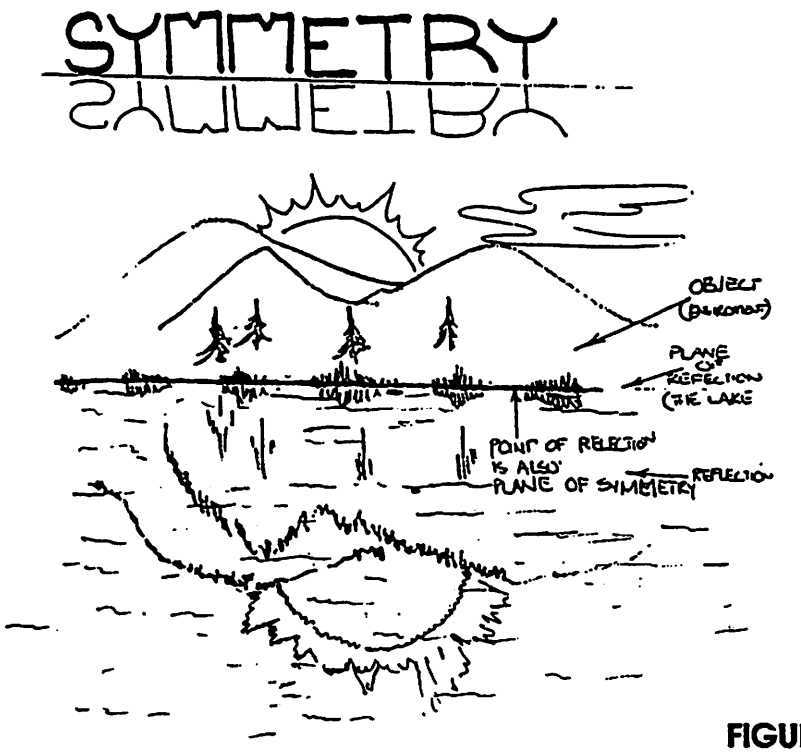
Any credence given to the study of mathematics must recognize that God is the original mathematician. And though, through the ages, humankind has experimented to be able to draw conclusion in the areas of mathematics, God's laws are error-free and constant. His everlasting watch-care in the "natural" cyclic phenomenas of this earth daily prove His mathematical supremacy. Galileo is remembered for having acknowledged that "mathematics is the language that God used to create the universe".

The December 1993/January 1994 edition of *The Journal of Adventist Education* makes a profound statement:

> Everywhere in nature are evidences of mathematical relationships. These are shown in ideas of number, form, design, and symmetry, and in the laws governing the existence and harmonious working of all things. (In) the study of these laws, ideas, and processes, mathematics reveals some of God's creative attributes. Learning mathematical processes, axioms, and laws can help students to more clearly identify God's design and handiwork in nature. These show Him to be a God of system, order, and accuracy who can be depended upon. His logic is certain. By thinking in mathematical terms, we are actually thinking God's thoughts after Him.

When God created the earth, everything was perfect. There was symmetry, beauty and constancy and He was pleased with His work. However, when man, the crowning act of God's creation sinned, deterioration commenced and the subsequent disorder led to the defacing of God's handiwork. It is to procure the restoration of the image of God in man, that led Christ to Calvary and the divine process will thus have come full circle when the divine imperative is achieved.

APPENDIX



One can see his reflection in a lake, not just his reflection, but the reflection of the environment around him. The lake itself could be termed an axis of symmetry. The environment is reflected on this axis of symmetry or plane of reflection. And if the lake is completely undisturbed, it will reflect the environment; as if it were a flat mirror

FIGURE 1

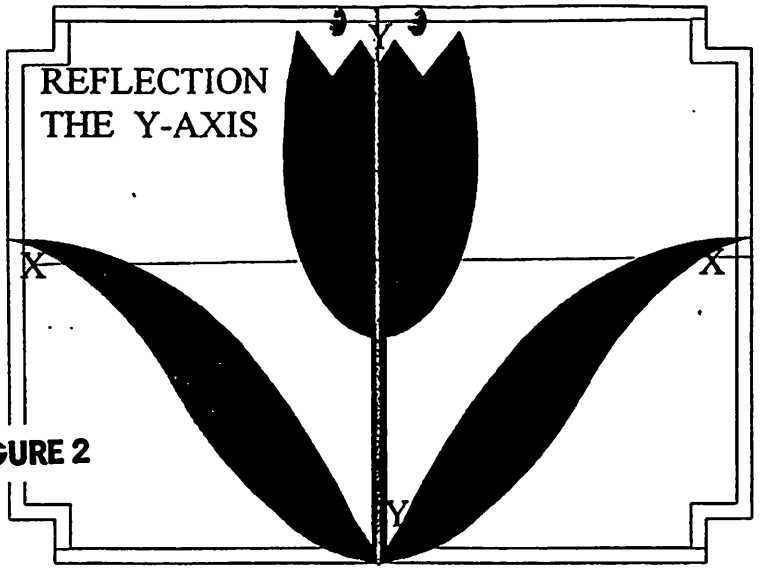
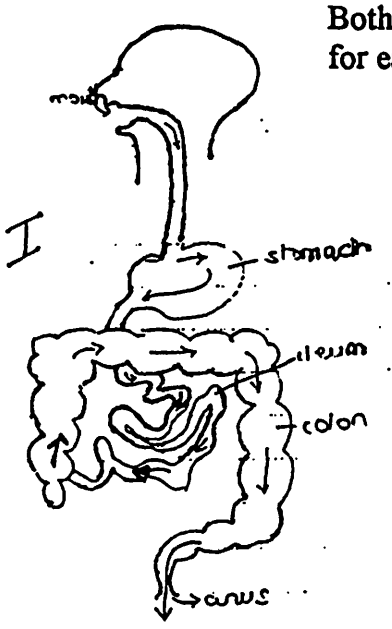


FIGURE 2

{Figure 1 shows symmetry with respect to the x- axis while Figure 2 shows symmetry with respect to the y-axis. This means that the objects looks the same on top and bottom, and left and right, respectively.}

This mathematical display is based
on the principle: input → output.
Below, two systems are displayed:
Both systems produce unique outputs
for each likely input



$g(x) = x^3 + x^2 + 2x - 1$
$g(2) = (2)^3 + (2)^2 + 2(2) - 1$
$g(2) = 8 + 4 + 4 - 1$
$g(2) = 15$

II

FIGURE 3

Functions and Graph

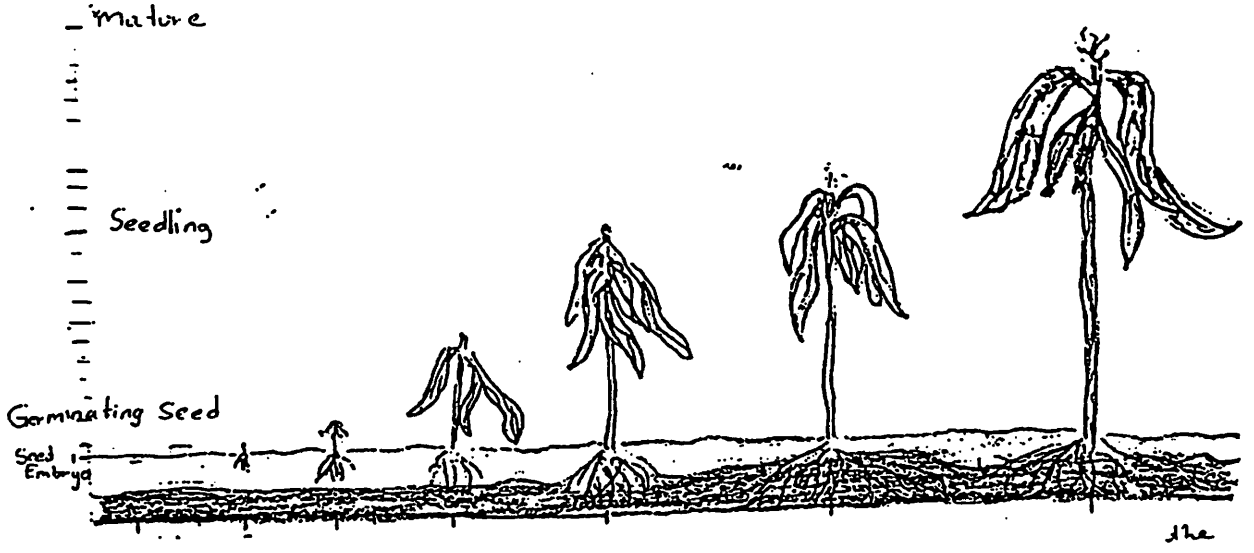


FIGURE 4 Water, Sunlight, manure, pesticide and other aids are required for growth of a plant. (Inputs)

{Figure 3 and Figure 4 both represent functions. This implies that for each input there is a specific output. Figure 3 compares the human body and a mathematical function while Figure 4 shows a germinating seed receiving various inputs and the output is its growth.}

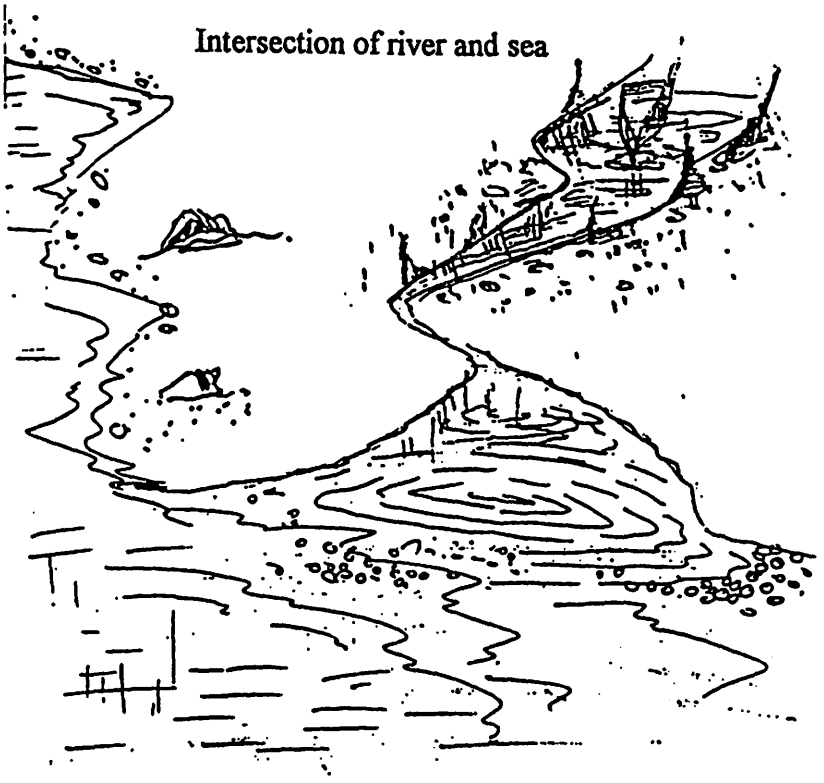


FIGURE 5

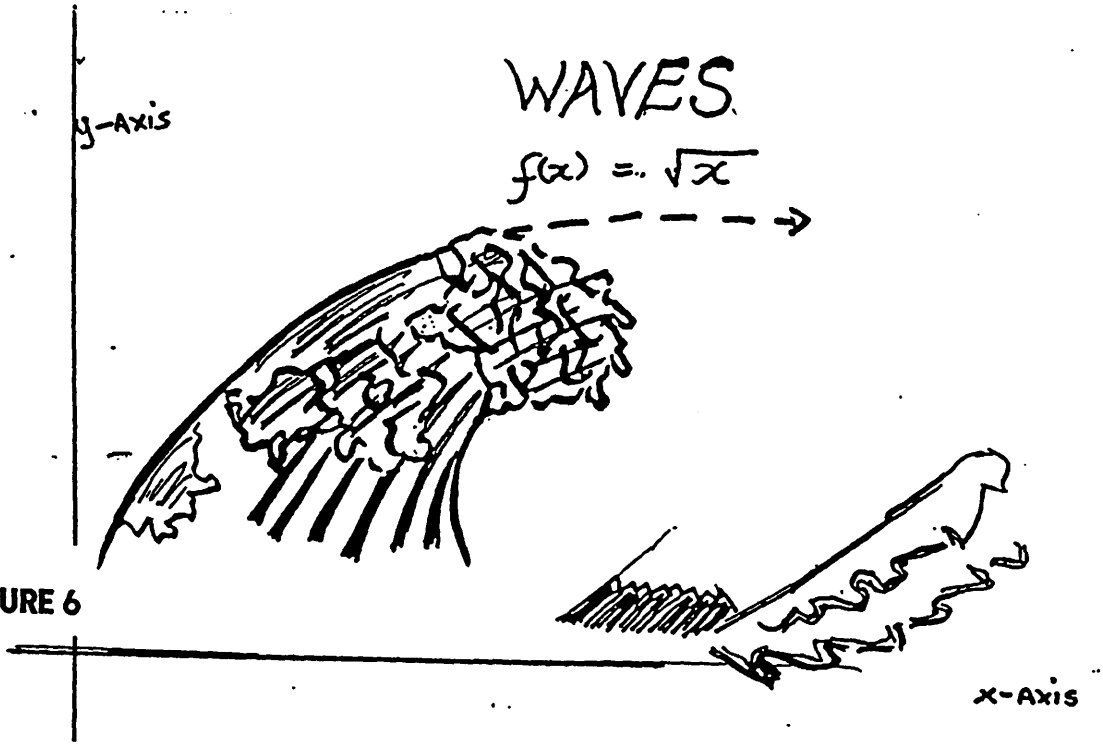


FIGURE 6

{Figure 5 shows the intersection of two bodies of water and the resulting stream. Figure 6 shows that the natural rise of the wave exhibits the shape of the square root function}

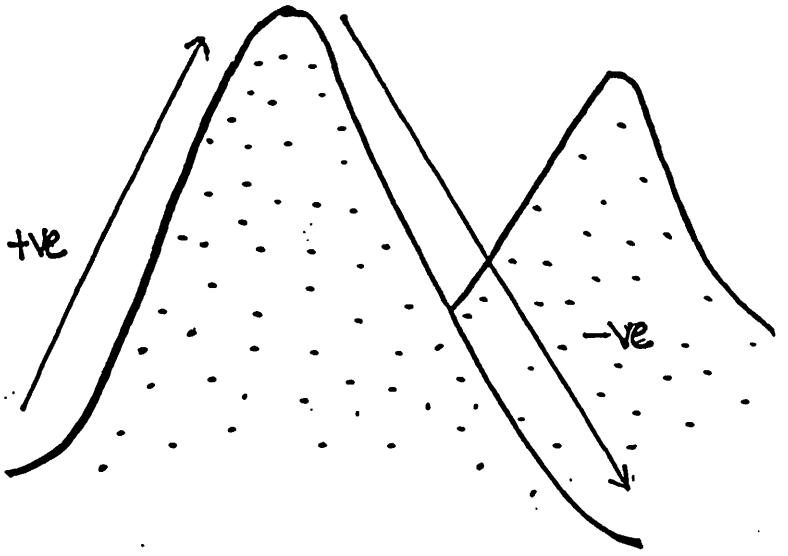
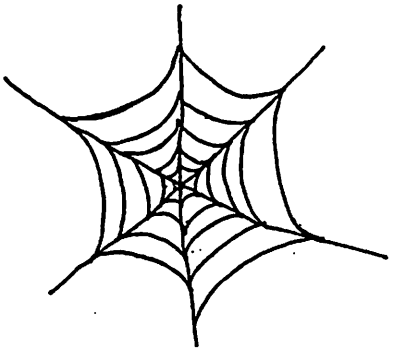


FIGURE 7 Slope

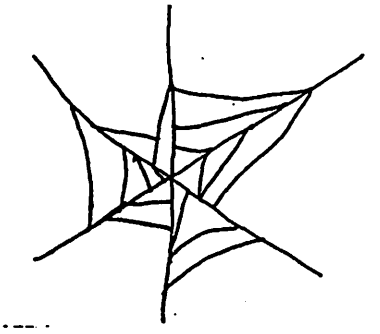
THE SPIDER'S WEB



CONTINUITY

HEXAGONS

Hexagons are the geometric shapes found in wasp's nests. They have six equal sides and six equal angles.



{Man's interference}
DISCONTINUITY

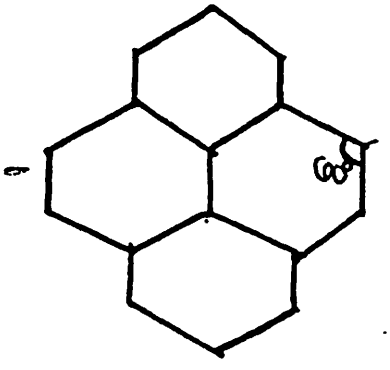


FIGURE 8

FIGURE 9

{Figure 7 shows positive slope as the rise of a mountain and the negative slope as the decline. Figure 8 shows the geometric shape of a wasp's nest. Figure 9 shows the perfection of a spider's web until it is altered by external forces}

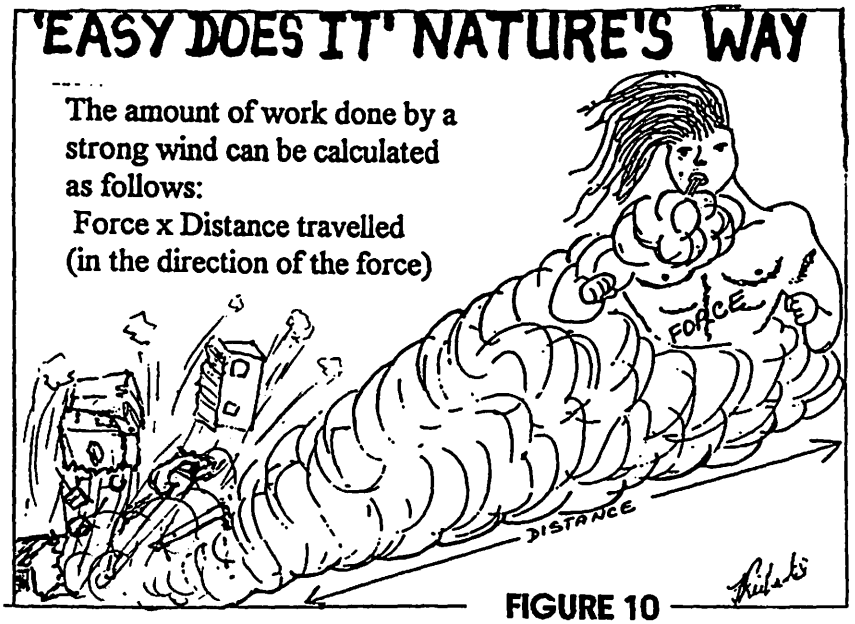


FIGURE 10

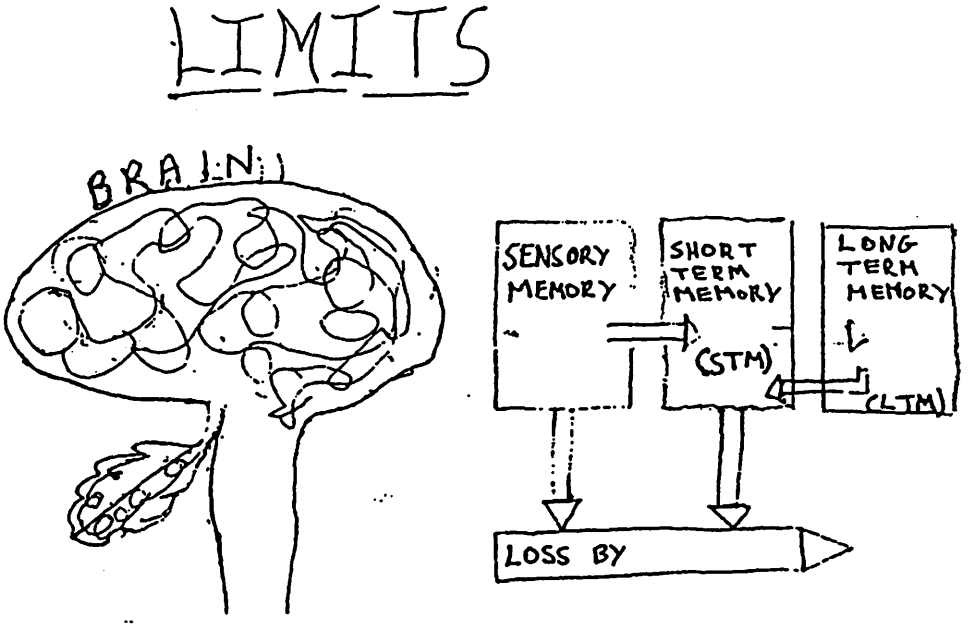


FIGURE 11

lim (memory) ≃ 0 items → sensory	lim (memory) =7 items → STM	lim (memory) = ∞ items → LTM
Memory is lost in a split second	Can hold up to 7 items as a package	Long term memory has an unlimited capacity

{Figure 10 shows the impact of forces of nature. Figure 11 shows how memory varies in retention capability from the sensory to long-term.}

DERIVATIVE AS A RATE OF CHANGE

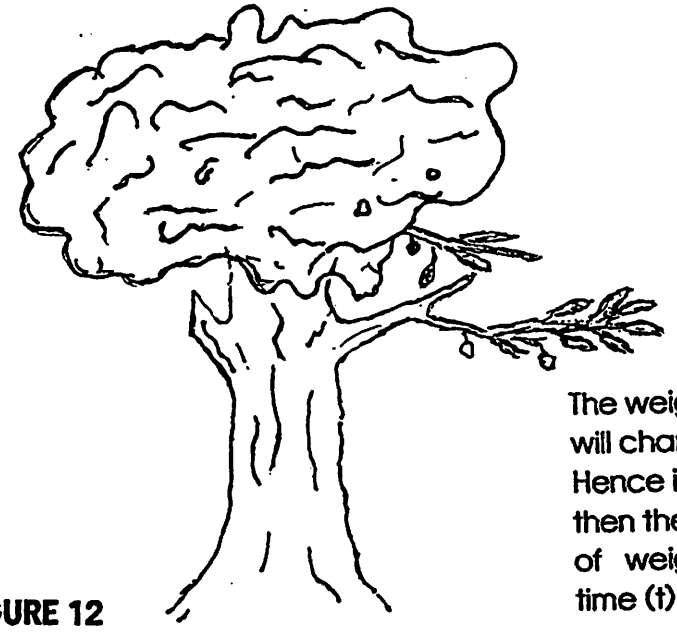


FIGURE 12

The weight of a limb of the tree will change as time (t) goes by. Hence if the weight $w = 2t^3$, then the relative rate of change of weight (w) with respect to time (t) can be found $\frac{dw}{dt} = 6t^2$

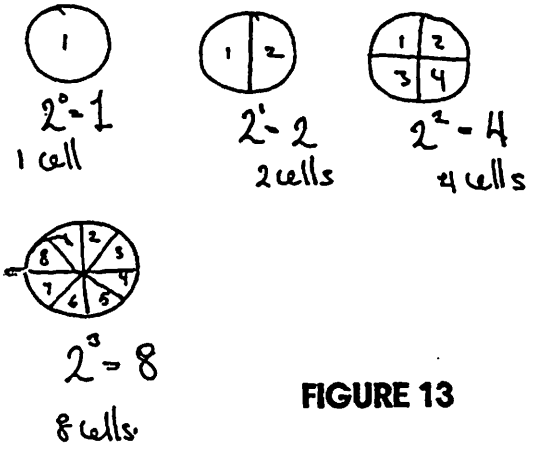
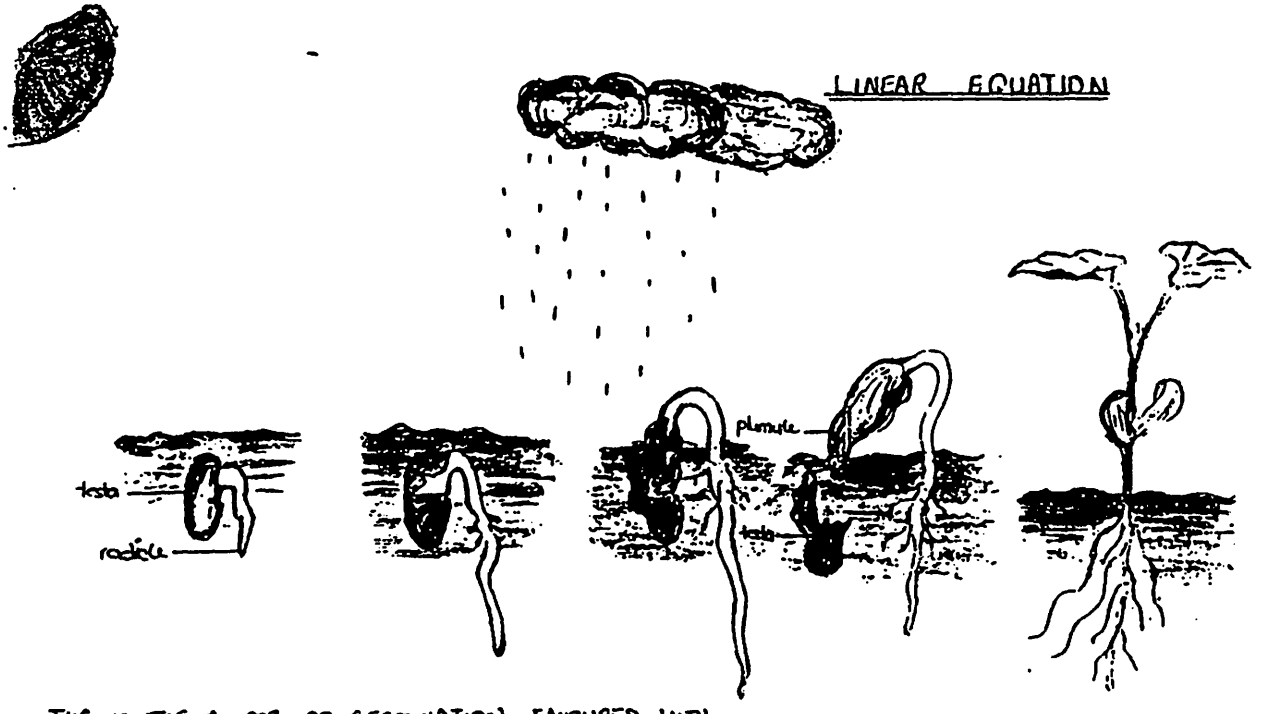


FIGURE 13

CELLULAR DIVISION

Every cell except sex cells divide by mitosis - the division of a cell to produce 2 identical cells.
After a certain amount of divisions, you can calculate the number of cells by using the formula 2^n
{n = number of divisions}

{Figure 12 describes the changing weight of a tree limb as time passes. Figure 13 shows the duplication of cells by mitosis which is an exponential function.}



THIS IS THE COURSE OF GERMINATION FAVOURED WITH CONDITIONS SUCH AS TEMPERATURE, SUNLIGHT AND MOISTURE.

FIGURE 14

{Figure 14 demonstrates the course of germination}

WORKS CITED

Bell, Frederick H. Teaching and Learning Mathematics (in Secondary Schools). Iowa: W. C. Brown Co., 1978

Coffin, Harold G. Creation: Accident or Design?. Washington D.C.: Review & Herald Publishing Association. 1969. p 41

Guyer, Michael F. and Lane, Charles E. Animal Biology. 5th ed. New York: Harper & Row, Publishers, 1964. p. 74

Haeussler Jr, Ernest F., and Paul, Richard. Introductory Mathematical Analysis (for Business, Economics and the Life and Social Sciences). 7th ed. New Jersey: Prentice Hall, 1993. p. 325

Hill, Barry. Seventh-day Adventist Secondary Curriculum - Mathematics. 1st ed. November 1990 p. 8, 15-22

Holy Bible, The (New King James Version)

Keeton, William T. Biological Science. 3rd ed. New York: W. W. Norton & Company, 1976. p. 579

Korniejczuk, Raquel I. and Brantley, Paul S. "From Creeds to Deeds: Teacher Integration of Faith and Learning in the Classroom." Journal of Adventist Education. December 1993/January 1994 Vol 56, No 2. p. 14 (Previously cited from Frank Gaebelain (1968) and the South Pacific Division Curriculum Frameworks (1991)

Polya, George. How to Solve It. New Jersey: Princeton University Press, 1971.

The Seventh-day Adventist Bible Commentary. Vol 1, Maryland: Review and Herald Publishing Association, p. 217

Smith, Karl J. The Nature of Mathematics. 5th ed. California: Brooks/Cole Publishing Company, 1987. p. 5

Taylor, John W. "God, Nature, and Learning: An Integrational Approach". Christ in the Classroom. Vol 2. p. 262

White, Ellen G. Counsels on Education. California: Pacific Press Publishing Association, 1968, p. 172

_____. Counsels on Health. California: Pacific Press Publishing Association, 1951, p. 19

_____. Counsels to Parents, Teachers, and Students. Idaho: Pacific Press Publishing Association. 1943, p. 63

_____. Spiritual Gifts. Vol III - IV. Washington D.C.: Review & Herald Publishing Association. 1945, p. 34

_____. Testimonies for the Church. Vol 3. California: Pacific Press Publishing Association. 1948, p. 138-9