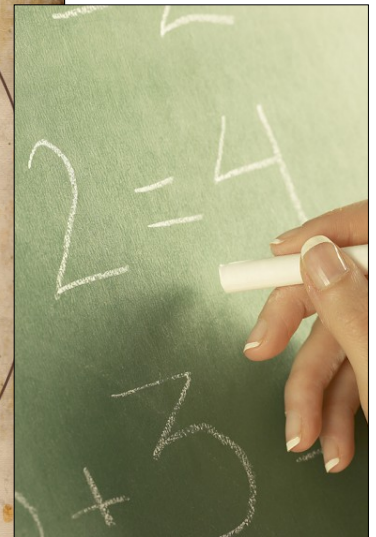


Mathematics:

A Christian Perspective



STUDENT VERSION

© Gino Santa Maria. Image from BigStockPhoto.com.

James Bradley, Calvin College
Andrew Busch, Fremont High School, Fremont, Michigan
David Klanderman, Trinity Christian College
Eve Ricketts, Grand Rapids Christian High School
Gary Talsma, Calvin College

Materials prepared on behalf of the Kuyers Institute of Calvin College, March 2006

Table of Contents

Chapter 1: Why Study Math?	Page 3
Chapter 2: Mathematics, Modernism, and Postmodernism	Page 15
Chapter 3: Fibonacci Numbers and the Golden Ratio.....	Page 28
Chapter 4: Exponential Functions	Page 35
Chapter 5: Hypercubes	Page 41
Chapter 6: Paper or Plastic? No, Thanks!.....	Page 55
Chapter 7: The Indian Ocean Tsunami: December 26, 2004.....	Page 70
Chapter 8: The Gender Gap	Page 87
Chapter 9: Simpson's Paradox	Page 102

© 2007, 2008 THE KUYERS INSTITUTE.

Kuyers Institute for Christian Teaching and Learning

www.pedagogy.net

www.calvin.edu/kuyers

Layout and Design by Teresa Wyngarden.

Images from Clipart.com and BigStockPhoto.com.

Copies may be made for nonprofit classroom use only.

Not for commercial printing.

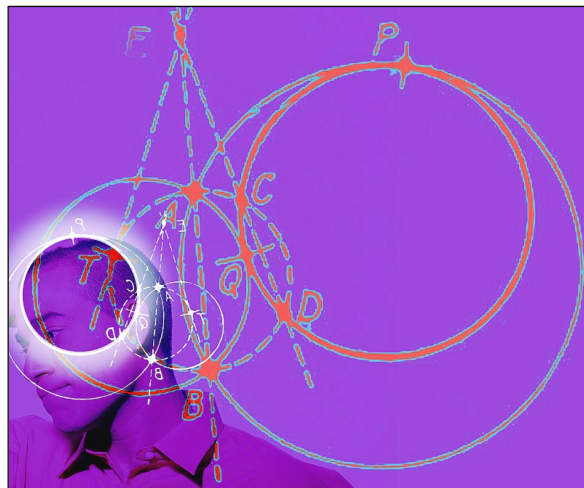
2

Mathematics, Modernism, and Postmodernism

In the previous unit we explored the idea that God has created us with the capacity to use mathematics to describe and explore patterns that he has built into his creation. His purposes in giving us this capacity are that we might worship him and that we might serve as stewards of his creation.

However, we live in cultures that are often shaped by ideas quite different from Christian ideas. In this unit, we will explore two views of mathematics widely held by our surrounding cultures. One, called modernism, originated in a historical period called the Enlightenment. This period began in the early 1700s and was the predominant perspective of Western scholars and intellectuals until shortly after the middle of the twentieth century. It placed a very high value on mathematics and other forms of analytic thought—in fact, in European history the eighteenth century is often called the “Age of Reason.” The second perspective is called postmodernism, and its origin can be dated around roughly 1960. As we shall see, it has quite a different perspective on mathematics and reason. Today, much of the legacy of modernism still exists, but postmodernism is the predominant mode of thought in Western countries particularly in film, music, and other expressions of popular culture. Although these perspectives originated in Western Europe and the United States, they have shaped cultures throughout the world. For example, two of the most influential ideologies of the twentieth century, democracy and socialism, are products of modernism.

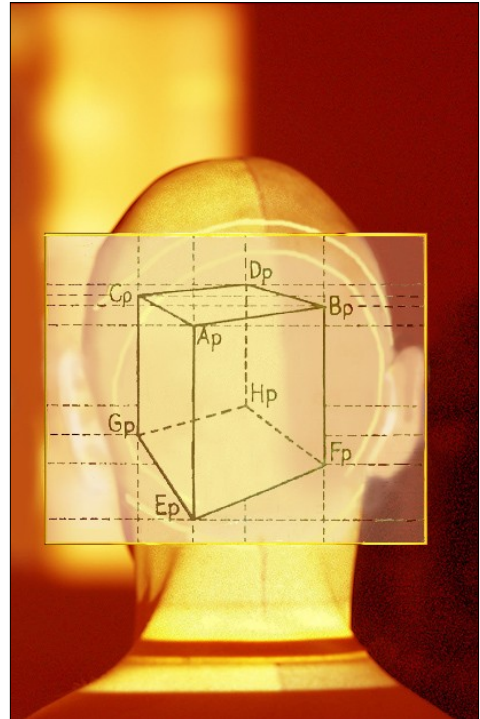
From a Christian perspective, modernism and postmodernism have strengths and weaknesses. We will explore them both in terms of their approaches to mathematics and human reason.



- 1) Here are several statements made by Enlightenment thinkers. As you read each one, fill in Table 1 on page 18. You saw some of the quotes in an earlier unit.

Philosophy is written in this grand book, the universe, which stands continually open to our gaze. But the book cannot be understood unless one first learns to comprehend the language and read the letters in which it is composed. It is written in the language of mathematics, and its characters are triangles, circles, and other geometric figures without which it is humanly impossible to understand a single word of it; without these, one wanders about in a dark labyrinth.

Galileo Galilei (1564–1642)
Il Saggiatore, 1623



In brief, the real world is the totality of mathematically expressible motions of objects in space and time, and the entire universe is a great, harmonious, and mathematically designed machine.

Morris Kline, *Mathematics in Western Culture*,
describing Descartes' views, 1964

One cannot escape the feeling that these mathematical formulas have an independent existence and an intelligence of their own, that they are wiser than we are, wiser even than their discoverers, that we get more out of them than was originally put into them.

Heinrich Hertz, quoted by Eric T. Bell
in *Men of Mathematics*,
New York, 1937

Archimedes will be remembered when Aeschylus is forgotten, because languages die and mathematical ideas do not. "Immortality" may be a silly word, but probably a mathematician has the best chance of whatever it may mean.

Godfrey Harold Hardy (1877–1947),
A Mathematician's Apology,
London, Cambridge University
Press, 1941

From the time of Kepler to that of Newton, and from Newton to Hartley, not only all things in external nature, but the subtlest mysteries of life and organization, and even of the intellect and moral being, were conjured within the magic circle of mathematical formulae.

Samuel Taylor Coleridge (1772–1834), *The Theory of Life*.

If we possessed a thorough knowledge of all the parts of the seed of any animal (e.g., man), we could from that alone, by reasons entirely mathematical and certain, deduce the whole conformation and figure of each of its members, and, conversely if we knew several peculiarities of this conformation, we would from those deduce the nature of its seed.

Rene Descartes (1596–1650), *Discourse on Method*, 1637

The essential fact is that all the pictures which science now draws of nature, and which alone seem capable of according with observational facts, are mathematical pictures.

Sir James Jeans, in J. R. Newman (ed.)
The World of Mathematics,
New York: Simon and Schuster, 1956.

*Epitaph on Isaac Newton's tomb:
Nature and Nature's law
lay hid in night:
God said, "Let Newton be!,"
and all was light.*

Alexander Pope
(1688–1744)



How can a modern anthropologist embark upon a generalization with any hope of arriving at a satisfactory conclusion? By thinking of the organizational ideas that are present in any society as a mathematical pattern.

Edmund Ronald Leach (1910–89),
Rethinking Anthropology. 1961

The modern, and to my mind true, theory is that mathematics is the abstract form of the natural sciences; and that it is valuable as a training of the reasoning powers not because it is abstract, but because it is a representation of actual things.

T.H. Sanford in N. Rose,
Mathematical Maxims and Minims,
Raleigh NC, Rome Press Inc., 1988.

Author	What does this statement say about math or its role in the world?	Do you agree?	Why or why not?
Galileo			
Kline			
Hertz			
Hardy			
Coleridge			
Descartes			
Jeans			
Pope			
Leach			
Sanford			

Table 1. Some modernist views of mathematics.

- 2) Modernism was very optimistic. Modernist thinkers sought grand designs—comprehensive explanations that would account for all of reality and foundational principles; basic laws that underlay the physical universe, history, and even human thought itself. Modernists tended to believe that such principles and laws could be expressed mathematically. However, if modernism can be called the “Age of Reason,” postmodernism may best be called the “Age of Skepticism.” It’s particularly skeptical of grand designs and foundational principles. So postmodernism has a radically different view of the role of mathematics in reality than did modernism. In the rest of this section, we will begin by exploring a few statements that discuss postmodernism in general. Then we’ll look at the postmodern view of mathematics. In the following sections, we’ll explore a Christian perspective on both outlooks. This time, read all of the quotes first, then fill in just the modernism and postmodernism columns in Table 2 at the end of this section—you’ll fill in the third column later.

...postmodern thinkers have given up the Enlightenment quest for any one universal, supracultural, timeless truth. They focus instead on what is held to be true within a specific community. They maintain that truth consists in the ground rules that facilitate the well-being of the community in which one participates. In keeping with this emphasis, postmodern society tends to be a communal society.

Stanley J. Grenz, *A Primer on Postmodernism*



The current postmodern belief is that a correct description of Reality is impossible. This extreme skepticism, for which Karl Popper and Thomas Kuhn are particularly famous, assumes that;

- a) All truth is limited, approximate, and is constantly evolving.*
- b) No theory can ever be proved true (we can only show that a theory is false).*
- c) No theory can ever explain all things.*
- d) Thus absolute and certain truth that explains all things is unobtainable.*

Introduction to Postmodernism,
<http://www.spaceandmotion.com/Philosophy-Postmodernism-Post-Modernism.htm>

The only absolute truth is that there are no absolute truths.

Paul Feyerabend
<http://www.spaceandmotion.com/Philosophy-Postmodernism-Post-Modernism.htm>

From the modern point of view, the philosopher of mathematics is trying to penetrate beyond the cultural phenomenon of mathematical activity to the ultimate origin or foundation of this activity. From the postmodern viewpoint, there is no such origin or deeper reality behind mathematical activity. All we know is how mathematics has been practiced in historical context.

Again, from a modern point of view, mathematics as independent of cultural elements has a unity, universality, and coherence, of its own that we humans seek to plumb. The postmodern thinker says that this is nonsense. There is nothing at all that is represented in culture that is not shaped and fashioned by this culture—and in many different ways from one culture to the next and from one era to the next.

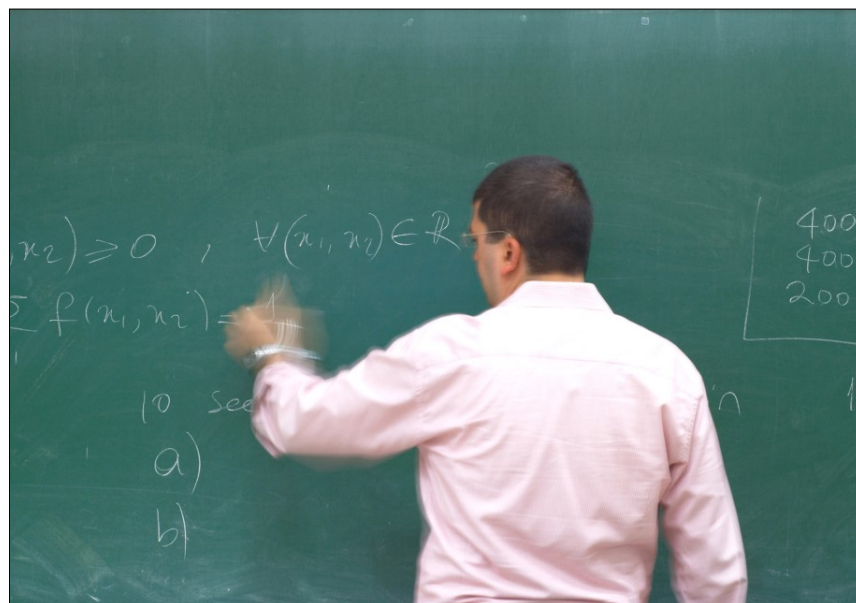
The postmodern attack on the modern view of the nature of mathematics is concentrated in the following aspects...

Deny the long-standing view called mathematical realism (or Platonism) that holds that mathematical entities like numbers, functions, structures and the like exist independently of us...

Deny the correspondence theory for the truth of propositions. The correspondence theory says that the way one describes the truth of everyday propositions applies to mathematical propositions. Thus a mathematical proposition is true if and only if it says of what is the case that it is the case. The mathematical realist would be inclined to affirm a correspondence theory while anti-realists would tend to see propositions as having a validity that depends on cultural context...

Mathematics in a Postmodern Age

ed. by Russell Howell & James Bradley, 2001



© khz. Image from BigStockPhoto.com.



© mrlolz. Image from BigStockPhoto.com.

Postmodernists complain that science is a cultural prejudice, and/or a tool invented by the current elite to maintain power, and/or only one "way of knowing" among many, with no special privilege. For postmodernists, science is "discourse," one system among many, maintained by a closed community as a means of holding onto power, and ultimately referential only to itself.

Edward R. Friedlander, M.D.,
Why I am Not a Postmodernist,
www.pathguy.com/postmod.htm

To account for the apparent certainty and objectivity of mathematical knowledge I claim first that mathematics rests on natural language, and that mathematical symbolism is a refinement and an extension of written language. The rules of logic and consistency which permeate the use of natural language provide the bedrock on which the objectivity of mathematics rests. Mathematical truths arise from the definitional truths of natural language, acquired by social inter-action...the truths of mathematics are defined by implicit social agreement—shared patterns of behavior—on what constitute acceptable mathematical concepts, relationships between them, and methods of deriving new truths from old. Mathematical certainty rests on socially accepted rules of discourse embedded in our 'forms of life.'

Paul Ernest, *Social Constructivism as a Philosophy of Mathematics*, 1998

Aspect	Modern View	Postmodern View	Christian View
Optimism/ Pessimism			
The Nature of Truth			
The Importance of Truth			
The Importance of Personal Relationships			
Grand Narratives			
Science			
The Origin of Mathematical Knowledge			
The Certainty and Objectivity of Mathematics			
How Much Can Mathematics Accomplish?			
The Importance of Reason			
Power of the Human intellect			
Role of God			

Table 2. Contrasting the Modern, Postmodern, and Christian Perspectives

3) Now that we have compared modernism and postmodernism, you may find yourself asking “So what?” The next few questions will explore what difference it makes.

a. We are constantly surrounded by messages that try to turn us toward one or the other of these worldviews. It’s impossible to entirely avoid being influenced by these messages. Suppose a person finds him or herself drawn toward the modernist perspective. What aspects of modernism could affect that person’s relationship with God—positively or negatively?

b. Now answer the same question for a person who feels drawn toward postmodernism.

c. Suppose you meet a student from another school at a party. Following are several things that student might say during conversation. For each one, how would you respond if you were a thoroughly committed modernist? A thoroughly committed postmodernist? Remember, don’t try to reply according to your own beliefs—try to see the situation through the eyes of a person with one of these two belief systems.



© karen4. Image from BigStockPhoto.com.

“It really doesn’t matter what you believe. Everybody has their own truth.”

“Lying is neither right nor wrong. It depends on whether or not the benefits of lying exceed the consequences.”

“Science deals with facts. Religion merely deals with opinions.”

“I suppose if someone’s going to become an engineer, math might be useful. But I’m not going to be an engineer, so it has no value to me.”

- 4) We’ve now looked at two worldviews—modernism and postmodernism—and have seen that the view one takes can have a huge impact on our relationship with God and with other people. So let’s look at both world-views from a Christian perspective.
 - a. Read the quotation and answer the following three questions.

John Calvin recognized the signal importance of rigorous training in the liberal arts and a thorough knowledge of the Patristic tradition for the conduct of theology. For these are an invaluable help in rendering the content of scripture accurately, and presenting it persuasively. For this reason Calvin and his theological descendants did not make an enemy of reason and tradition in their attempt to elevate the faith. Rather, they sought to make allies of them according to a certain agreement as to their roles and mutual relationships: the authority of scripture above the authority of tradition, whose role was to develop and retain right interpretation of scripture; faith serving as a guide to reason, whose primary task was to make the content of faith both perspicuous and persuasive. In terms of the sources of theology, then, Reformed theology draws on the following in descending order of authority: scripture; the traditions of the church; reason and experience.

Calvin College, the Core Curriculum,
http://www.calvin.edu/admin/provost/facdoc/core_curr.htm

What is the main idea in this statement?

What does this statement have to say about the Enlightenment idea of truth?

What does this statement have to say about the postmodern idea of truth?

- b. A Christian thinker of the 1600s, Blaise Pascal, wrote:

Two errors—to deny reason and to admit only reason.

What would Pascal say to a modernist? To a postmodernist?

- c. Consider the Christian perspective on mathematics that we developed in the first unit—that God made both the physical universe and the human mind, that he created our minds in such a way that we can understand the underlying mathematical structure of the physical universe, and that God’s purposes in doing this were that we should worship him and be able to serve as stewards of his creation. Keeping this perspective in mind, go back and complete the right-hand column of Table 2 on page 22.

Projects

- ❖ Think carefully about the following problem and write out your thoughts on it. The basic truths of mathematics (such as $1 + 2 = 3$ and the Pythagorean Theorem) seem very certain. But they are not revealed to us in the Bible. How then can people know they really are true?

- ❖ Here’s an excerpt from the script of the first *Star Wars* movie.

Luke lines up the yellow cross-hair lines of the targeting device's screen. He looks into the targeting device, then starts at a voice he hears.

Ben’s Voice: *Use the Force, Luke.*

EXTERIOR: SURFACE OF THE DEATH STAR.

The Death Star trench zooms by.

INTERIOR: LUKE’S X-WING—COCKPIT.

Luke looks up, then starts to look back into the targeting device. He has second thoughts.

Ben’s Voice: *Let go, Luke.*

A grim determination sweeps across Luke's face as he closes his eyes and starts to mumble Ben's training to himself.

EXTERIOR: SURFACE OF THE DEATH STAR.

Luke's fighter streaks through the trench.

INTERIOR: DARTH VADER’S COCKPIT.

Vader: *The Force is strong with this one!*

EXTERIOR: SURFACE OF THE DEATH STAR.

Vader follows Luke's X-wing down the trench.

INTERIOR: LUKE'S X-WING— COCKPIT.

Luke looks to the targeting device, then away as he hears Ben's voice.

Ben's Voice: *Luke, trust me.*

Luke's hand reaches for the control panel and presses the button. The targeting device moves away.

INTERIOR: MASSASSI OUTPOST—WAR ROOM.

Leia and the others stand watching the projected screen.

Base Voice: *(over speaker) His computer's off. Luke, you switched off your targeting computer. What's wrong?*

Note Luke's turn from a rational way of knowing—using the computer—to an intuitive way of knowing; trusting the voice of his now-dead mentor, and depending on the Force. Find another example in recent film or television where the turn away from rational ways of knowing is portrayed as heroic. If possible, find a script for it; if not, write a summary of the scene you have picked. Explain how your example illustrates the broader turn in contemporary culture from modernism to postmodernism.