Notes on Logic and Critical Thinking

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Part I: Introduction to Arguments.

> "Logic gives great promise. For it provides a mastery of invention and judgment, as well as supplies ability to divide, define, and prove with conviction. It is such an important part of philosophy that it serves the other parts in much the same way as the soul does the body. On the other hand, all philosophy that lacks the vital organizing principle of logic is lifeless and helpless."
> -John of Salisbury, Metalogicon, Book II Ch 6.

Introductory Remarks:

Philosophical writing is made up of **arguments**, and learning philosophy involves learning how to make, understand, and evaluate arguments. But philosophers are not the only people who use arguments: whether you realize it or not, you are presented with arguments every day. Politicians try to persuade us, newspaper editorials urge us, friends and teachers present us with new information and alternative points of view. Whenever someone tries to persuade you to believe something, you are being offered an argument.

Some arguments are good, and some arguments are bad: Good arguments are rationally persuasive: they provide us with good reasons to believe the conclusions they lead us to draw. Bad or fallacious arguments, on the other hand, do not provide with good reasons to believe their conclusions. When we are presented with a bad argument, we do not gain any good reasons to believe the conclusion.

Still, some bad arguments are **effectively persuasive**: even though they do not provide good reasons for their conclusions, people are bamboozled into accepting these conclusions anyway. To say that such arguments are not rationally persuasive is to say that they provide no good reasons, no rational ground for believing that the conclusion is true. But we are not perfectly rational creatures, and we don't always recognize when we're being bamboozled.

These notes will focus on some tools that may help us out: tools we can use to critically analyze arguments with which we are presented so that we will not easily be bamboozled. Since we are presented with arguments in many different contexts, these tools are valuable both in philosophical and in non-philosophical contexts. But since philosophical writing is almost entirely constituted by

arguments, these tools of critical analysis are especially important for students of philosophy.

John of Salisbury, author of the quote you encountered at the beginning of this section, regarded logic as the science that studies making and evaluating good arguments. Philosophical writing without logic, he claimed, is dead: like a body without a soul, as he put it. Ideally, philosophical writing should be clear and precise; it should appeal to our desire for truth, not to our hopes or illusions. And good philosophical arguments should offer good reasons to believe the conclusions they offer us.

We need to be able to distinguish good arguments from bad or fallacious ones. But how can we recognize when arguments are good? How can we avoid being taken in by arguments that are bad? In this unit, we will consider several varieties of argument, and standards for their evaluation.

Objectives:

-You should learn to recognize and distinguish arguments of several different types: deductive, inductive, and abductive.
-You should learn to distinguish between the form and content of an argument.
-You should learn do define key concepts: argument, premise, conclusion, evidence, rationally persuasive argument, fallacy, valid argument, invalid argument, inductive argument, abductive argument, conditional statement, circular argument, redundancy theory of truth.
-You should learn to evaluate arguments, by distinguishing premises from conclusion, putting the argument in standard form, and critically examining the premises and the inference pattern.

ARGUMENTS: A PHILOSOPHICAL INTRODUCTION

Philosophical 'arguments' are not like other arguments you might have. When we speak of 'arguments,' we may think of flaring tempers, heated exchanges, and raised voices. But philosophical arguments aren't like that—at least, they **shouldn't** be like that. In this course, when we speak of 'arguments' we refer to writing that seeks to persuade, and which offers reasons to back up some belief or other that the author intends us to adopt. Here is a formal definition:

> **Argument:** A set of statements, some of which serve as **premises**, one of which serves as a **conclusion**, such that the premises purport to give evidence for the conclusion.

This is a somewhat technical definition. Before it will be clear, there are at least three parts that require clarification. The definition employs two technical terms: **premise**, and **conclusion**. Clarifying these terms requires three additional definitions:

Premise: A **premise** is a statement that purports to give **evidence** for the conclusion.

Evidence: To say that a statement A is **evidence** for another statement B is to say that if A were true, this would provide some reason to believe that B is true.

Conclusion: The statement in an argument that is supposedly supported by the evidence.

Whenever someone is trying to persuade you that something is true, that you ought to believe something, you are being presented with an argument. In such circumstances, you should begin by making sure that you understand exactly what it is that you are supposed to believe—what is the **conclusion** of the argument. Then you should clarify exactly what **evidence** is being offered for that conclusion.

Recognizing Arguments: It is not always easy to recognize when you are being presented with an argument. Sometimes arguments are incompletely stated; sometimes the conclusion of an argument is not given explicitly because the person giving the argument hopes that it will be clear that the reasons given lead to it. When you examine arguments, it is a good idea to begin by identifying the conclusion and re-stating it in your own words. Try to determine exactly what the argument aims to show.

Indicator words: Sometimes writers use language that indicates the structure of the argument they are giving. The following words and phrases indicate that what follows is probably the **conclusion** of an argument:

Therefore…
thus…
for that reason…
hence…
it follows that…

Other indicator words are typically used to identify claims that are intended to provide evidence. They indicate that what follows is probably a **premise** of the argument:

Because…
Since…
For…
For the reason that…

When you evaluate arguments, it may help to begin by identifying any indicator words and clearly distinguishing the premises of the argument from the conclusion. For example, consider the following:

> **"Because** animals are conscious, capable of experiencing pain and pleasure, they are like people in significant respects. **Since** they are also intelligent—often far more intelligent than newborn babies for example, **it follows that** they deserve kind treatment from human beings and that it is wrong to treat them with cruelty."

In this argument, indicator words clearly identify the premises from the conclusion.

Standard Form: Usually we find arguments expressed in ordinary prose. But as noted, when we are evaluating arguments it is a good idea to separate the premises from the conclusion, and to put the argument into "standard form." We say that an argument is in **standard form** when the premises are numbered and listed separately, and when the conclusion is clearly written underneath them.

Here is an interpretation of the argument above in standard form:

> (1) Animals are conscious.
> (2) Animals are capable of experiencing pain and pleasure.
> (3) Animals are intelligent.
> (4) Animals are like people in significant respects.
> Conclusion:
> (5) Therefore (i) animals deserve kind treatment from humans and (ii) it is wrong to treat animals with cruelty.

Whenever we put an argument in standard form, we have given an **interpretation** of that argument. Ideally, an interpretation should accurately capture the meaning of the original, but it is always possible to challenge the accuracy of an interpretation.

Missing or Implied Premises: Notice that the *premises* of this argument are all factual claims, while the conclusions are moral claims. Can factual claims support moral claims in this way, or are other premises needed to connect the premises with the conclusion? Some arguments have *missing* premises that are *implied but unstated.* In order properly to evaluate such arguments, we need to insert the missing premises so that they can be evaluated. In the argument above, the simplest way to repair the argument would be to insert a premise that associates consciousness, sensitivity to pain and pleasure, and similarity to people with the claims about deservingness and cruelty in the conclusion. What implied premises would you add to this argument to make it stronger? Are the implied premises credible?

It is often useful to interpret philosophical arguments by putting them in standard form, and then criticizing the argument as he has reconstructed it. As a conscientious reader, you should look for different ways to evaluate the argument under discussion:

First, you should consider whether he has accurately represented the original argument. If not, is the original argument stronger or weaker than the interpretation?

Second, consider the strength or weakness of the argument under the interpretation given. Are the premises true? Do the premises provide adequate support for the conclusion?

Evaluating Arguments: An Example:

Consider the following argument.

> "Laws regulating gun ownership are wrong. For such laws are characteristic of fascist and authoritarian political regimes, not of free democratic regimes like our own. The founders recognized that gun ownership by citizens is the only way to insure that the government won't overstep its authority, since armed citizens would rise up to oppose such tyranny."

What is the author of this passage trying to persuade you to believe? What reasons are being offered? In this case there are few indicator words used, but it is not hard to figure out what the author would like us to believe. You might begin by expressing the argument in your own terms. To do this, it might be necessary to look up any unfamiliar words to be sure that you understand what the author means. For example, in the above argument you might find it necessary to look up some of the terms that are highlighted in the argument above.

Putting the Argument in Standard Form: To analyze the argument, begin by identifying the conclusion and the premises.

Conclusion: In the argument above, the 'conclusion' is stated in the very first sentence: The author is inviting you to conclude that "Laws regulating gun ownership are wrong."

Premises: What is the evidence offered? In this case, there are a number of different claims that are intended to give evidence for the conclusion. Some of them are combined in the individual sentences of the argument, but in evaluating the argument it will be helpful to articulate them as separate, independent statements. Here is one way to put the argument above into **standard form:**

1) Fascist and authoritarian regimes regulate gun ownership.
2) Free democratic regimes do not regulate gun ownership.
3) The founders believed that gun ownership among citizens would prevent the tyrannical abuse of power.
4) Where citizens own guns, they will be able to use their guns effectively to oppose the abuse of power.
5) Gun owning citizens will in fact rise up to oppose the abuse of power.
6) There is no other effective way to prevent the abuse of power.
Conclusion:
7) Therefore laws regulating gun ownership are wrong.

In putting this argument into standard form above, premises have been separated into individual claims. In evaluating this argument, you will need to consider each premise and whether it is true or false. Then you should consider the inferential structure of the argument: if the premises **were** true, would they provide good reasons for believing the conclusion? In this interest, you should try to think like a lawyer who wants to make a case in court by convincing a jury. What would you say in response to each of these claims if you wanted to demonstrate that it is false? Finally, does this standard-form interpretation of the argument capture the *best reading* of the argument?

To give a full evaluation of the argument, you would need to consider each of the premises, and the extent to which the premises provide real support, not just the illusion of support, for the conclusion.

Premise 1: "Fascist and authoritarian regimes regulate gun ownership."

Evaluation: In evaluating this premise, you would need to consider whether it is true that authoritarian regimes typically regulate gun ownership. What if you simply don't know? In order to evaluate this premise, you might need to do some research on which countries have laws regulating gun ownership. Sometimes outside research of this kind is necessary for the evaluation of philosophical arguments too: even philosophical arguments often depend on facts. But often you will not need to look beyond the philosophical sources available to you in order to find the information you need to evaluate the premises of a philosophical argument.

Premise 2: "Free democratic regimes do not regulate gun ownership."

Evaluation: If you read the newspaper you may already know that that this premise is simply false. Many democratic regimes, including the United States of America, have instituted strict regulations on the possession of weapons—in fact, it may be that *all* democracies regulate gun ownership.

But you might wonder whether this premise has been appropriately interpreted here: perhaps the author intended to urge that free democratic nations *should not* regulate gun ownership. Such a premise, however, would be

too much like the conclusion. The premises should provide *support* for the conclusion, but should not simply state the conclusion. An argument that includes its own conclusion among its premises would be *circular.*

> **Premise 3: "**The founders believed that gun ownership among citizens would prevent the tyrannical abuse of power.

Evaluation: Once again, in order to evaluate this premise you might need to find out just what "the founders" believed about this subject. Your research would reveal that some of the founders really did believe that gun ownership would prevent the abuse of power. Jefferson, at one point in his life, believed that the United States would experience occasional violent revolutions. He believed that it was a good thing that "the tree of liberty" would occasionally be watered with "the blood of patriots and tyrants." But "the founders" were not unanimous about this, and others hoped that institutional provisions could be put in place to prevent the abuse of power, and regarded the prospect of violent revolution with horror. Madison clearly hoped that the Constitution would protect against the abuse of power without resort to violence.

> **Premise 4: "**Where citizens own guns, they will be able to use their guns effectively to oppose the abuse of power."

Evaluation: You may already have a justified opinion about this premise—it might in this case be unnecessary to do further research. You might reason as follows: It may have been plausible for Jefferson to suppose that armed citizens might effectively oppose the power of the federal government. But with the rise of modern professional armies it is no longer plausible to think that any group of "armed citizens" could effectively oppose a group of Marines equipped with modern weapons. Modern military training and technology have made it unlikely that citizens could effectively oppose their government.

> **Premise 5: "**Gun owning citizens will in fact rise up to oppose the abuse of power."

Evaluation: Once again, evaluating this premise may not require outside research: While there are obvious exceptions—fanatics and criminals—it is likely that most gun owners are conscientious and law abiding citizens. They are unlikely to join a revolution that would require them to use their weapons to shoot American soldiers or police officers.

> **Premise 6:** There is no other effective way to prevent the abuse of power.

Evaluation: The U.S. constitution includes powerful institutional safeguards against the abuse of power. The division of the power of the federal government among the several branches of government has been, as Madison surely hoped,

a important barrier to the abuse of power. While it has not prevented all abuse, it has arguably been effective in preventing the kind of egregious abuse that could justify violent revolution. It seems wrong, then, to say that there is ”no other way” to prevent the abuse of power. But the author might instead urge that gun ownership provides a key barrier to the abuse of power.

Overall Evaluation: As you can see, many of the premises offered in the argument we have considered here are highly questionable. Some are obviously false. Recognition of this fact should undermine your confidence in the argument given, but it should not by itself lead you to conclude that the conclusion of the argument must be false. Perhaps there are other good reasons to think that it is wrong to regulate gun ownership, they are just not the reasons given above. If you wanted to show gun regulations are wrong, you would need to construct a better argument than the brief one given above, or show that the argument can be re-interpreted in a way that makes it stronger.

A Strategy for Evaluating Arguments: Of course, for the purposes of this course, your views about gun control are not what matter. What does matter is the strategy used here for evaluating the argument under consideration:

> **First,** identify the argument’s premises, and restate them clearly.
>
> **Second,** evaluate each premise individually: is it true or false? What evidence, what information would you need to know in order to determine whether the premises are true?

If you discover that the premises of the argument are simply false, you may need to go no further. But if the premises seem true, there is a third important step to take in evaluating the argument:

> **Third,** consider the relationship between the premises and the conclusion. What kind of argument is it? Is it a good argument of its kind?

In this unit we will consider three different kinds of good arguments: deductive arguments, inductive arguments, and abductive arguments. For each of these different kinds, we will consider what makes arguments of that kind strong or weak.

Fallacies: We might also consider the classification of bad arguments and fallacies:

> **Fallacy:** An argument that provides the illusion of support, but no real support, for its conclusion.

When people are taken in by bad arguments, often it is because they don’t recognize that the argument is fallacious. It is interesting that arguments of the

same fallacious types seem consistently to bamboozle people. By learning how to recognize these fallacies, you can avoid being bamboozled yourself.

Fair-Mindedness and the State of Suspended Judgment: When evaluating arguments, we should strive to be impartial and fair-minded. We should try to follow where the best reasons lead instead of pre-judging the conclusion. This is not always easy to do: most American students probably already have a view about the legal regulation of gun ownership. But a Judge cannot perform her job well if she makes up her mind that the defendant is guilty before the lawyers have presented their arguments. And Similarly, a philosopher cannot do a good job evaluating arguments if she has already made up her mind before looking closely at the evidence offered. In looking at an argument, you should do your best to adopt an attitude of suspended judgment. At the very least, you should be open to the **possibility** that the author is right and that the argument is a good one.

With some issues, it is impossible to be fully impartial: For example, most students cannot honestly claim to adopt an attitude of full suspended judgment when considering arguments for or against the existence of God. Whether they are theists, atheists, or agnostics, most people have set views about this question. But in considering such arguments, you must still do your best to evaluate arguments on their own merits. You must seriously consider the reasons given, and if you find yourself unpersuaded, sticking to the beliefs you had from the start, you have an intellectual obligation to explain where the argument goes wrong.

To sum up: Whenever someone is trying to persuade you that something is true, you are being offered an **argument.** In such circumstances, you should be sure to figure out exactly what it is that you are invited to believe, and exactly what evidence is being offered. Then you should evaluate the argument: are the reasons you have been offered **good reasons**? Are they true? If they are true, do they provide good evidence for the conclusion?

Self Test: Argument, premise, conclusion, indicator words, fallacy, rationally persuasive.

Exercise: Find an example of a fallacious argument on the web. Critically analyze the argument (be brief!), and explain what fallacy has been committed.

Logic and Critical Thinking:

Part II. Deductive Arguments

II.I Argument Types:

It is important to be able to recognize when you are presented with an argument, and to evaluate the premises given. But in order to effectively evaluate arguments it is also important to recognize what **kind** of argument has been given. Here we will identify three different kinds of **good argument:** deductive arguments, inductive arguments, and abductive arguments. It will be helpful to have clear definitions of these three types:

> **Deductively Valid Argument** (sometimes called just a "deductive argument" or a "valid argument")**:** An argument is **deductively valid** just in case it has the following property: If the premises are true, then the conclusion cannot be false.

Example 1: (Aristotle)
(1) All men are mortal.
(2) Socrates is a man.
(3) Socrates is mortal.

Example 2:
(1) All vertebrates have hip bones.
(2) Snakes are vertebrates.
(3) Therefore, snakes have hip bones.

Notice that these two arguments have the same basic structure, even though they are about different subject matter. One is about men, mortality, and Socrates, the other is about vertibrates, hip-bones, and snakes. But they both share a common form:

(1) All A are B.
(2) S is A.
(3) Therefore S is B.

If arguments have the same *form*, then it may be easy to analyze and evaluate them for validity: If we know that the first argument is valid (it is), then we know that any argument that has the same form will also be valid.

Later we will consider some standard, valid deductive argument forms. If you were to take a course in symbolic logic, you would learn rigorous methods to test argument forms to see whether they are deductively valid.

Inductive Argument (or 'induction')**:** A nondeductive argument in which characteristics of individuals not in a sample are inferred from the characteristics of individuals in a sample.

Example:
(1) 95% of all examined fish from the Otsoga river contained dangerous levels of mercury.
(2) This fish came from the Otsoga river.
(3) Therefore, this fish (probably) contains dangerous levels of mercury.

Many scientific studies are organized as inductive arguments of this kind. Unlike deductively valid argument forms, it is possible that the premises in an inductive argument may both be true, but the conclusion false. In the example given, the individual fish we took from the river may have escaped poisoning somehow. Inductive arguments like this one give good reasons to believe their conclusions, but the reasons are not infallible.

Abductive argument (or 'abduction')**:** A form of nondeductive inference, also called "inference to the best explanation" in which a hypothesis is supported on the ground that it is the best explanation for some observed phenomenon.

Example:
(1) This pair of dice rolled "double-sixes" on 95 out of 100 rolls.
(2) The best explanation for this run of double sixes is that the dice are trick dice, specially weighted to so that they will roll "double sixes."
(3) Therefore (probably) these dice are trick dice.

Like the conclusions of inductive, the conclusions of abductive arguments are only **probable,** given the truth of the premises: if an argument is inductive or abductive, it is possible for the premises to be true and the conclusion false**.** Inductive and abductive arguments can be good arguments: that is, they can be rationally persuasive and can provide good reasons for believing their conclusions. You probably accept the conclusion of an inductive argument if you would refuse to eat an untested fish from the Otsoga river. You accept an abductive argument if you would refuse to let me use my special double-six dice the next time we play a game of chance. But nondeductive arguments do not guarantee the truth of their conclusions (given the truth of the premises) in the way that deductive arguments do.

II.II Deductive Argument Forms

Deductive arguments are reliable in a way that inductive and abductive arguments are not: in a deductive argument, the truth of the premises *guarantees* the truth of the conclusion. But this does not mean that the

conclusion of a deductive argument must be true. Consider the following example:

(1) All dogs are marsupials.
(2) Ralph is a dog.
(3) Therefors, Ralph is a marsupial.

This argument has the same deductively valid form as the arguments mentioned above (the ones about Socrates and Snakes). But the conclusion is false! Deductive validity does not guarantee that the conclusion of an argument will be true, it only guarantees that it will be true *if the premises are true.* In this argument, premise (1) is false: dogs are not marsupials. In fact, the conclusion of the earlier argument is also false: Snakes do not have hip bones (not all of them anyway), so the first premise of that argument is false.

Conditional Arguments:

Some deductive argument forms are easy to recognize. Some are so familiar to logicians that they have been given *names.* In this section we will consider two common valid argument forms, and two common invalid argument forms.

Statements that have the form "If X then Y" are called ***conditional statements.*** Arguments that have such a statement as the first premise are called ***conditional arguments.*** In such a statement, the first term X is called the ***antecedent of the conditional,*** since it comes first. 'Antecedent' means 'that which comes first.' The second term Y is called the ***consequent of the conditional.*** 'Consequent' means 'that which comes after.'

Modus Ponens: We can construct a simple valid conditional argument as follows:

(1) If <Jon swam in the skunk river>, then <he stinks>.
(2) <Jon swam in the skunk river.>
(3) Therefore <Jon stinks.>

The form of this argument is:

(1) If X then Y.
(2) X
(3) Therefore Y

This argument form is so familiar that medieval logicians gave it a name: It is called **Modus Ponens.** Because the second premise of the argument asserts the antecedent of the conditional statement in the first premise, this form is also sometimes called ***"Affirming the Antecedent,"***

Modus Tollens: Another easily recognized and valid form looks like this:

(1) If X then Y.
(2) Not Y.
(3) Therefore Not X.

For example:

(1) If the food had been poisoned, the dog would be dead.
(2) The dog is not dead.
(3) Therefore, the food wasn't poisoned.

Because the second premise of this argument form denies the consequent of the conditional, this form is sometimes called ***Denying the Consequent.***

Invalid Conditional Arguments: There are two correlate forms of conditional argument that are *in*valid:

Denying the Antecedent:

(1) If X then Y.
(2) Not X
(3) Therefore Not-Y.

Affirming the Consequent:

(1) If X then Y.
(2) Y.
(3) Therefore X.

These argument forms are both *invalid.* This means that it is possible for the premises to be true, but the conclusion false. How would you *demonstrate* that these argument forms are invalid?

Testing for Validity: Only deductive arguments can be valid. Abductive and inductive arguments are never valid, even if they are excellent arguments that provide good reasons in support of their conclusion.

If an argument has a simple form, it is sometimes possible to evaluate its validity just by looking at it. But other arguments are too complicated, and we need to use other methods to check their validity. If you took a course in formal logic you would learn methods for checking the validity of arguments.

Sometimes we can discover that arguments are invalid by an informal method: When presented with an argument, we consider whether we can think of a counterexample: an argument that (1) has the same form, (2) has true premises,

but (3) has a false conclusion. If we can think of such an example, then we know that the argument is invalid.

But what if we can't think of such a counterexample? It does not follow that the argument under consideration is valid, since we might have found an example if we had just thought about it more carefully. If you take a course in deductive logic, you will learn more reliable methods for determining whether or not an argument is deductively valid.

What if we do find a counterexample? While we can conclude that the original argument was invalid, we cannot conclude that it was a bad argument. Inductive and abductive arguments are always invalid, but they sometimes provide very good reasons for believing their conclusions. We would still need to consider whether the argument under consideration was a good nondeductive argument.

Lecture 2, Self-Test

True or false:

Some deductively valid arguments have false premises.
Some invalid arguments have true premises and a true conclusion.
Some invalid arguments have true premises and a false conclusion.
Some invalid arguments have a valid logical form.
Some deductively valid arguments have a false conclusion.
Some deductive arguments have true premises even though their conclusion is false.
All deductively valid arguments have the same logical form.

Term	**Definition:**
Argument	Set of statements, some of which are premises and one of which is a conclusion.
Premise	A statement that gives evidence.
Evidence	If it were true, it would constitute a reason for believing the conclusion.
Fallacy	An argument that gives only the illusion of support for a conclusion.
Abduction	Inference to the best explanation Induction Argument that extends what is known about a sample and applies it to a whole class.
Invalid	The truth of the premises does not guarantee the truth of the conclusion.
Conclusion	The statement an argument is intended to get you to believe.
Form	The logical structure of an argument.

Indicator words — Words that help to show which statements are premises and which the conclusion.

Quiz Questions:

1) Good arguments are those that are **rationally persuasive.** Rationally persuasive arguments are those that have which of the following properties:

a. Rationally persuasive arguments are those that would persuade only fully rational persons.
b. Rationally persuasive arguments are those that all rational persons will be persuaded to accept their conclusions.
c. Rationally persuasive arguments are those that provide good reasons to think that their conclusions are true.
d. Rationally persuasive arguments are those that will persuade most people to accept their conclusion.

2) A Deductively valid argument is

a. An argument with true premises and a true conclusion.
b. An argument that has the property that if the premises are false, then the conclusion must also be false.
c. An argument that has the property that if the premises are true, then the conclusion cannot be false.
d. An argument that has the property that if the conclusion is true, then the premises must also be true.

3) An argument is deductively valid by virtue of

a. The truth of its premises.
b. Its logical form.
c. The truth of its premises and its conclusion.
d. The fact that in argument can still be valid even if its premises and conclusion are all false.

4) An argument is invalid just in case

a. It is possible for the conclusion to be false even if the premises are true.
b. The premises give inadequate evidence, or no real evidence for the conclusion.
c. The conclusion is false even though the premises are true.
d. The premises are false and give inadequate support to the conclusion.

5) To test an argument for invalidity, find another argument that has the same form, but which has the following feature:

a. The premises are false but the conclusion is true.
b. True premises but a false conclusion.

c. The premises are false and the conclusion is false.

6) If an argument is invalid, it can be repaired by

a. Adding a true premise that constitutes good evidential support for the conclusion.

b. Adding a true premise such that the original premises plus the new premise guarantee the truth of the conclusion.

c. Adding a new premise that, although false, would provide evidence for the conclusion.

7) Among the following arguments, which ones have the same form?

Argument 1:
(i) All fish are mortal.
(ii) Socrates is a fish.
(iii) All fish are Socrates.

Argument 2:
(i) Some dogs have fleas.
(ii) No animals with fleas are allowed in the house.
(iii) Some dogs are not allowed in the house.

Argument 3:
(i) All goats smell.
(ii) George is a goat.
(iii) George smells.

Argument 4:
(i) Some arguments have false premises.
(ii) No argument with false premises is a good argument.
(iii) Some arguments are bad arguments.

Argument 5:
(i) All my cookies have chips in them.
(ii) The cookie I gave you was one of mine.
(iii) The cookie I gave you has chips in it.

Argument 6:
(i) All babies yell.
(ii) Jonathan is a baby.
(iii) Jonathan yells.

Argument 7:
(i) Some French wines are dry and delicious.
(ii) No New York wines are dry and delicious.
(iii) No New York wines are French.

8) Show that the following argument is invalid:

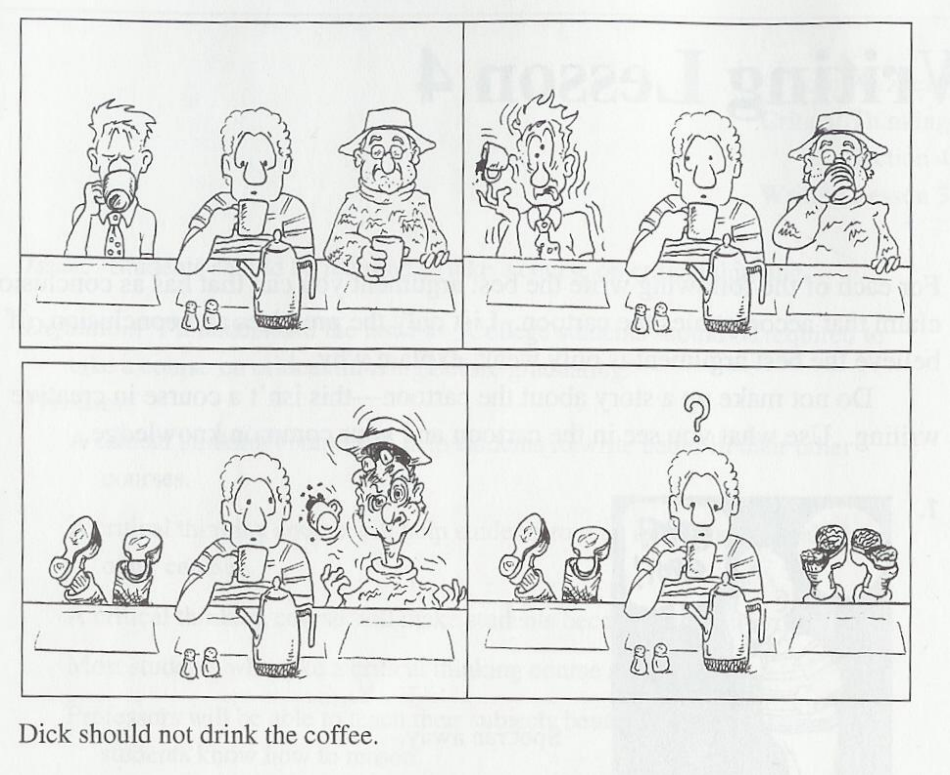
Argument:
(i) If this stone is a diamond, it can be used to cut glass.
(ii) This stone can be used to cut glass.
(iii) Therefore, this stone is a diamond.

Part III: Inductive and Abductive Arguments

If you find that an argument is **deductively valid**, you have a kind of ironclad guarantee: You can be absolutely sure that the conclusion is true if the premises are true. Of course, you cannot be certain that the conclusion of the argument is true, since a deductively valid argument may have one or more false premises.

How can we know whether the premises are true? Perhaps when we analyze an argument and consider the first premise, p1, we find that we have **good reasons** to believe that p1 is true. Then we can identify those reasons as premises of a different argument—an argument that has p1 as its conclusion. But then we need to critically analyze that argument too by considering our reasons for accepting its premises as true… Even deductive arguments rarely if ever make their conclusions **certain**, since we rarely have deductive certainty about the premises. Maybe we never have such certainty.

But we may have good reasons for believing something even when we do not have certainty that it is true. Many **good** arguments give a somewhat weaker guarantee concerning the truth of their conclusions, and we often cannot afford to wait for deductive certainty before making a decision. For example, consider the following cartoon:



Source: Richard L. Epstein, *Critical Thinking,* Illustrated by Alex Raffi. P. 60. Wadsworth Publishing Company.

Dick does not have deductive proof that the coffee caused his companions to keel over. It is possible that there is some other explanation for their troubles. But obviously Dick has some **good reasons** to believe that he should avoid drinking the coffee. Dick might reason as follows:

> (1) Other people around me keeled over after drinking this coffee.
> (2) The best explanation for them keeling over is that there is something wrong with the coffee.
> (3) Therefore it is likely that I would also keel over after drinking this coffee.

The argument is not deductively valid: the other two people may have been ready to keel over anyway, and maybe they would have done it even if they had not tasted the coffee. We can imagine an objector who might say "I'm not going to believe anything unless I have a deductively valid argument that proves that it's true." Maybe we should let such fanatical logicians make their own choices about whether to drink the coffee. In a dangerous world, such fanatics will not be long lived.

Nondeductive arguments to not guarantee the truth of their conclusion given the truth of the premises. But when nondeductive arguments are **strong**, the truth of their premises makes the truth of the conclusion probable. In this lesson we will consider two different forms of nondeductive inference. We will also discuss the evaluation of philosophical arguments.

Objectives

> -Distinguish simple deductive arguments from simple nondeductive arguments.
> -Recognize some species of good nondeductive arguments.
> -Evaluate the strength of inductive and abductive arguments.
> -Effecively use key concepts of nondeductive inference.
> -Generate abductive hypotheses in simple contexts, and evaluate their relative strength.

Pre-Text: In the previous section, we defined two kinds of nondeductive argument: Inductive arguments and Abductive arguments. Most scientific arguments are nondeductive arguments of these two types.

> **Inductive Argument** (or 'induction')**:** A nondeductive argument in which characteristics of individuals not in a sample are inferred from the characteristics of individuals in a sample.
>
> **Abductive argument** (or 'abduction')**:** A form of nondeductive inference, also called "inference to the best explanation" in which a hypothesis is supported on the ground that it is the best explanation for some observed phenomenon.

Here is an example of an inductive argument, from the previous section:

> **Example:**
> (1) 95% of all examined fish from the Otsoga river contained dangerous levels of mercury.
> (2) This fish came from the Otsoga river.
> (3) Therefore, this fish (probably) contains dangerous levels of mercury.

Is this a good argument? Maybe it's good enough to make you hesitate if you were about to sit down to a nice fish dinner. 95% seems like pretty good evidence.

If 95% of examined fish contained mercury, you might conclude that there is a 95% chance that any fish you catch in the Otsoga will contain mercury. Of course, this leaves a 5% chance that any particular fish will **not** contain mercury, so the conclusion of the argument is only probable, not certain. Sometimes probable conclusions are all we can get. And often it's all we need.

But even an apparently strong inductive argument may contain problems:

> What if all the fish examined in the study came from a pool next to a chemical plant, but you caught your fish upstream from the chemical plant?
>
> What if all the examined fish were bottom-feeding carp, but the one you caught was a trout? [Trout are less likely to contain poisons because they cannot survive in polluted water. Carp and catfish, on the other hand, are much more likely to contain pollution and poisons.]

Either of these would probably undermine your confidence that you have a poisoned fish. Either of these would suggest that the fish examined in the sample are not representative of the whole population, or that your fish may not be an average representative of the sampled population. Even so, given the risk of mercury poisoning caution might recommend that you should not eat this fish!

Inductive arguments may be strong or weak, but they are never valid. Inductive arguments are strong when the examined sample is representative of the larger population, and when the examined sample is appropriately large. If the sample is **biased**, or unrepresentative, and when the sample is small, inductive arguments will be weaker.

Many scientific arguments are inductions. But there is another type of argument that is often used in the sciences. This argument form is called "inference to the best explanation," or **abduction**. Here is an example of an abductive argument given by Aristotle:

> "The world must be spherical in shape. For the night sky looks different in the northern and southern regions, and this would be so if the earth were spherical." -Aristotle, *Physics.*

To put this argument in standard form, we might interpret it as follows:

(1) The night sky looks different in the northern and southern regions.
(2) The best explanation for this fact is that the earth is round.
(3) Therefore (probably) the earth is spherical in shape.

Is this an appropriate interpretation of Aristotle's argument? Aristotle never explicitly says that the "spherical earth" hypothesis is the best explanation for his observations. But we can interpret him as offering this kind of argument if this seems the best way to capture his intentions.

If we interpret the argument as an **abduction**, is it a strong or weak **abductive argument?** Of course we know that the conclusion is true. But looking back, we might regard Aristotle's inference as a shrewd and daring guess. The fact that the night sky looks different in north and south is not by itself very strong evidence for the claim that the earth is spherical.

THINK ABOUT IT: Can you think of an alternative explanation for Aristotle's observation? For example, What if the earth were shaped like an upside-down bowl? What if the sky was shaped like a bowed or wavy sheet? What if…? Would these alternative hypotheses explain Aristotle's data equally well? If Aristotle's argument is weak, how could he have found additional support for his "round earth" hypothesis that would make it stronger?

Word Watch:

Inductive argument
Abductive argument
Universal law
Sample bias
Surprise principle (omit)
Only game in town fallacy (omit)

Most scientific arguments are nondeductive: statistical studies involve inductive inferences, while the articulation and confirmation of natural laws (or putative natural laws) involves abduction.

Philosophical arguments are of many different kinds, and there may be "good arguments" that do not fit any of the three types described here. In reading philosophical works, you should try to identify the type of argument that is being presented. This will be very helpful as you try to critically evaluate it.

Logic and Critical Thinking:

Part IV: EVALUATING PHILOSOPHICAL ARGUMENTS

In this unit, we have been considering different kinds of arguments, and different standards for the evaluation of arguments. The other units in this course will use and evaluate arguments, but will not focus on them as we have done here. But the tools gained here will be crucial: you will use them as you read and critically evaluate arguments offered in the more substantive readings in this course.

Philosophical writing is constituted by arguments. Whenever you read philosophy, you should actively evaluate the arguments that are being presented. As you read the assignments and complete the lessons included in the later units of this course, you should apply the tools discussed in this early unit.

As you begin reading a work of philosophy, you should read actively and critically. As you read the assignments in this course, you should follow a four-step process:

(1) First Pass: First, read through the work rather quickly, noting difficult words, concepts and claims as you go. Make certain that you understand the main points the author is trying to make, and be sure to look up any unfamiliar or confusing terms or concepts. Make a list of words and phrases you don't fully understand, and look them up before you go further. Do not depend on **context** to give you clues about the meanings of words: many words that are common in everyday, conversational English have very specific and unique meanings when used in philosophical writing.

(2) Read for Understanding: In your second pass through the material, you should read slowly and deliberately. Take notes. Make sure that you understand each of the arguments offered, and that you understand what reasons are given to support the conclusions the author hopes to support. Clarify the claims the author makes—make sure you understand what the author means. Make sure that you understand what evidence is being offered in support of these claims. At this stage, you should strive to be a sympathetic reader: try to understand the argument in its own terms. It is a good idea to take notes on your reading as you go, putting the arguments given in your own words.

(3) Criticism and Objections: After you have finished reading the material carefully and have an understanding of the author's arguments, evaluate the claims made and the evidence given. In evaluating arguments, you should ask many questions: Are the premises true? Can you find evidence that some of the premises are false? Do the premises provide real support for the conclusion? Articulate the strongest objections and counter-arguments you can develop: try to construct an argument against the position the author has defended.

4) Re-Evaluation of the Argument: Finally, go back and read the text again, keeping in mind the objections you have raised and the counter-arguments you have developed. Does the author have resources to respond to your objections and counter-arguments? Are your objections conclusive, or are you inclined to accept the conclusion as well supported by the argument?

Once you have done this, you will have an opinion about the strength of the argument, and you will be able to give reasons to back your opinion up. And you will also have an opinion about the philosophical resources the author might use marshal when faced with skeptical objections. In short, you will have a good basic understanding of the text.

AN EXAMPLE: ANSELM'S ONTOLOGICAL ARGUMENT

There is no better way to learn how to read philosophy than to start doing it. Here is an argument by Anselm (Later "Saint Anselm) with one of the densest and most difficult, but also one of the most interesting and remarkable passages you will encounter this term. The lines have been numbered so that we can refer to them precisely. In a work titled Proslogion, Anselm writes:

> O Lord, you who give understanding to faith, so far as you know it to be beneficial, give me to understand that you are just as we believe , and that you are what we believe.
>
> We certainly believe that you are something than which nothing greater can be conceived.
>
> But is there any such nature, since "the fool hath said in his heart: "God is not."
>
> However, when this very same fool hears what I say, when he hears of "something than which nothing greater can be conceived," he certainly understands what he hears.
>
> What he understands stands in relation to his understanding (*esse in intellectu)*, even if he does not understand that it exists. For it is one thing for a thing to stand in relation to our understanding; it is another thing for us to understand that it really exists. For instance, when a painter imagines what he is about to paint, he has it in relation to his understanding. However, he does not yet understand that it exists, because he has not made it. After he paints it, then he both has it in relation to his understanding and understands that it exists. Therefore, even if the fool is convinced that "something than which nothing greater can be conceived" at least stands in relation to his understanding, because when he hears of it he understands it, and whatever he understands stands in relation to his understanding.
>
> And certainly that than which a greater cannot be conceived cannot stand only in relation to the understanding. For if it stands at least in relation to the understanding, it can be conceived to be also in reality,

> and this is something greater. Therefore, if "that than which a greater cannot be conceived" only stood in relation to the understanding, then "that than which a greater cannot be conceived" would be something than which a greater can be conceived. But this is certainly impossible.
>
> Therefore, something than which a greater cannot be conceived undoubtedly both stands in relation to the understanding and exists in reality. (Saint Anselm, from Sober, p. 125)

What's going on here? Unless you have studied philosophy somewhere else, it is more than likely that you have never read anything remotely like this in your life. In this case, part of the difficulty arises because the author is distant from us in time and culture: Anselm was a monk writing in Eleventh Century Europe. The passage was originally written in Latin, and sometimes translation makes a text more difficult. But there is no way around it: this short passage is difficult to understand. It was selected in part because it is probably one of the most difficult passages you will encounter in this course. But Anselm has expressed an argument here—a brilliant and interesting argument. It is worth your time to think carefully about this argument, and to understand it in its own terms.

If you are like most people, you did not understand this passage after reading it once. Indeed, there are intelligent people who have quite literally spent hours and days and even years working to fully understand this argument. Read it carefully once again before moving on to the next screen.

Let's analyze this passage using the four-stage process described above. In what follows, we have tried to imagine what might go on in the mind of a philosophy student faced with this text:

STEP 1, First Pass**:** Well, let's see: the author is clearly trying to say something about God. In the first sentence, he notes that we can identify God as "something than which nothing greater can be conceived. What does this mean? It seems to mean "It's impossible to think of anything greater than God."

I wonder whether I can put the idea in my own words: If nothing greater than God can be conceived, we might say that God is the "Greatest Conceivable Being," or the "GCB" for short.

Later Anselm considers the situation of the "fool" who "says in his heart" that God doesn't exist. Since he calls this person a "fool," it's a good bet that he's considering an argument against atheism and in favor of the claim that God exists. (I sure hope I don't need to know what the Latin in the middle paragraph means, but if I do I suppose I could ask the instructor.

In the middle paragraph, Anselm is considering ideas we have in our imagination and comparing them to real things that exist. Using these ideas, he seems to think at the end that he's proved that the GCB must really exist—must "exist in reality," not simply "in the mind." I'd better get clear on just how he thinks he's done this.)

STEP 2, Read for Understanding: Try to re-state the argument into your own words. If you can do this clearly and accurately, you will have an excellent understanding of the argument.

OK, Anselm says that when the "fool" [he means, the 'atheist'] says that "God doesn't exist," the atheist *understands* the idea of the GCB. Anselm also says that the concept of the GCB "stands in relation to his understanding." So the Atheist has the concept in mind, but doesn't believe that there is any thing that exists in reality that corresponds to that concept.

All that stuff about the painter seems designed to show that it is different for a thing to exist in the mind than for it to exist in reality. This supports the notion that the Atheist could understand the word "God" without believing in God.

The main part of the argument seems to be contained in the second last paragraph. Let's look closely at it. Anselm writes:

> "And certainly that than which a greater cannot be conceived cannot stand only in relation to the understanding. For if it stands at least in relation to the understanding, it can be conceived to be also in reality, and this is something greater. Therefore if "that than which nothing greater can be conceived" only stood in relation to the understanding, then "that than which a greater cannot be conceived" would be something than which a greater can be conceived. But this is certainly impossible."

This is difficult, but maybe I can put each sentence into my own words.

> **Anselm:** "That than which a greater cannot be conceived cannot stand only in relation to the understanding."
>
> **My** Reading: The GCB can't *only* exist as an idea in the mind.

I take it that he means that the GCB also exists in reality. What reasons will he offer for this claim?

> **Anselm:** "For if it stands at least in relation to the understanding, it can be conceived to be also in reality, and this is something greater."
>
> **My** Reading**:** If the GCB exists in the mind, then I can imagine it existing in reality. But it [the GCB] would be greater if it existed in reality.

Where is he going with this? He seems to be making a comparison, so it would be a good idea to be very clear about what he is comparing with what. Here are two different claims:

> **(1) The GCB exists in my understanding but not in reality.**

This would be the situation if people had the idea of God but there is no one and nothing that corresponded to that idea. If this were true, then the idea of God would be like the idea of a fictional person or creature, like Santa Clause or Godzilla.

(2) The GCB exists both in my understanding and in reality.

That would be the situation if people have the idea of God and there is a real being, God, who exists and who corresponds to this idea.

Anselm's claim is that when I conceive of a GCB that exists both in reality and in my understanding, I'm considering a *greater* being than when I conceive of a being that exists only in my understanding: Thus the GCB I think about when I consider 2 is greater than the GCB I think about when I consider 1. How could one be greater than the other if they're both supposed to be the greatest? This seems impossible. That question seems to bother Anselm too, since he next writes:

> **Anselm:** "Therefore, if 'that than which a greater cannot be conceived' only stood in relation to the understanding, then 'that than which a greater cannot be conceived' would be something than which a greater can be conceived. But this is certainly impossible."

My Reading: If the GCB exists in the understanding but not in reality, then I can conceive of an even *greater* being: one that would exist in reality too. I would then be *conceiving* of a being *greater than* the "Greatest Conceivable Being." But if the GCB is the greatest, then there is no greater! So this really is impossible.

Just as there is no elephant larger than the largest elephant, there is no conceivable being greater than the greatest conceivable being. Anselm is arguing that if we think of the GCB not existing, then our beliefs are contradictory. It is like saying that there is an elephant largest than the largest elephant.

At this point, Anselm seems to have shown that it is impossible that God could exist only in the mind and not in reality—if God existed only in the mind, then we could conceive of a greater being than God. Since we began by *defining* God as the "greatest conceivable being," this is impossible.

> **Anselm:** "Therefore, something than which a greater cannot be conceived undoubtedly both stands in relation to the understanding and exists in reality."

My Reading: Therefore the GCB exists both in the mind (we understand the idea of 'God') and in reality (God exists).

Anselm has reached the conclusion that God exists. How well does the argument support this conclusion? Let's consider its structure. There are many different ways to reconstruct an argument. Since we want to understand Anselm's argument in its own terms, we should try to reconstruct it in the most plausible way we can. Here is one such reconstruction in standard form, with the premises clearly distinguished from the conclusion:

> **Premise 1**: We have an understanding of the idea of God as the GCB (Greatest Conceivable Being). [That is, this idea "exists in our minds."]
> **Premise 2**: Suppose the GCB exists only as an idea in the mind, but not in reality.
> **Premise 3:** Then I could conceive of a being greater than the GCB: one that exists both in the mind and in reality.
> **Premise 4:** This leads to a contradiction: there can be no conceivable being greater than the greatest conceivable being.
> **Premise 5** (A preliminary conclusion from the fact that the supposition in premise 2 led to a contradiction): The supposition in Premise 2 must be false: the GCB cannot exist only in the mind and not in reality.
> **Premise 6** (A preliminary conclusion from steps 1 and 5): Since the GCB does "exist in our minds" (step 1) and it cannot exist only in the mind and not in reality (step 5), the GCB must exist in reality.
> **Conclusion:** God exists in reality.

Reconstructing arguments takes practice. As a beginning student of philosophy, you may not yet be in a position to reconstruct arguments in the way it's been done here. But reconstructing and rearticulating arguments in this way is an excellent way to gain an understanding of them. Once we have separated the premises from the conclusion, we are in a position to evaluate the argument's success.

STEP 3, Criticism and Objections:

Let's consider the premises individually, just as we did in the argument about gun control that you considered in the first half of this unit:

> **Premise 1:** We have an understanding of the idea of God as the GCB (Greatest Conceivable Being). [That is, this idea "exists in our minds."]

It might seem uncontroversial to think that we have the concept of the GCB in our minds. But perhaps one could argue that we can't have a full understanding of this idea—that our understanding must be limited by the confines of human intelligence. On the other hand, Anselm refers to the "greatest conceivable being." In order to conceive of such a being, we need not suppose that we can understand that being fully.

It is worth noting that Anselm's conception of God is not universally accepted. Not all cultures have this conception of God, and many do not currently employ anything like this conception of God. Not all religions incorporate this idea of God. Is this fact damaging to Anselm's argument? If people have no cultural or religious association with the idea of God as a "greatest conceivable being," they might still be able to consider the idea of a GCB. Perhaps this is enough to get Anselm's argument rolling.

> **Premise 2:** Suppose the GCB exists only as an idea in the mind, but not in reality.

This premise is a supposition for contradiction. Anselm does not believe that premise 2 is true. In fact, he hopes to show us that it is false. He hopes to show this by demonstrating that we are driven to absurdity if we accept this supposition: in this case, the absurdity of believing that we can conceive of a being greater than the GCB. Nonetheless, this supposition should be included as a premise of the argument.

> **Premise 3:** Then I could conceive of a being greater than the GCB: one that exists both in the mind and in reality.

This premise does assume that the GCB is greater if it exists in reality and not merely in the mind. Is this true?

Consider some things that "exist only in the mind," that is, some things that are only imaginary. Is it true that all of these things would be "greater" if they existed in reality and not merely in the mind or in the imagination? Consider, for example, the Mad Scientist in a science fiction movie—the one who wants to destroy all life on the earth. We're probably glad that this person is only imaginary— we hope that such a person "exists only in the mind and not in reality." So there are some things that would be worse, not greater, if they existed in reality. But premise 3 assumes that the GCB is greater if it exists in reality and not simply in the imagination. If some things are worse if they exist in reality and not simply in the imagination, is this an objection to premise 3?

Not necessarily: Anselm's claim is not that existence makes things better in general. Instead, he claims that when we think of an existent GCB we're thinking of a greater being than when we (try to) think of a nonexistent GCB. In fact, Anselm's claim is that the idea of a nonexistent GCB is a contradictory idea like the idea of a round square or a married bachelor:

> **Premise 4:** This (premise 3) leads us to a contradiction: there can be no conceivable being greater than the greatest conceivable being.

It does seem to be a contradiction to suppose that we could conceive of a being greater than the "greatest conceivable being." But this premise allows Anselm to move to a preliminary conclusion:

> **Premise 5** (A preliminary conclusion from the fact that the supposition in premise 2 led to a contradiction): The supposition in Premise 2 must be false: the GCB cannot exist only in the mind and not in reality.

Anselm's argument uses an inference rule called the proof by contradiction. This deductively valid form of argument is sometimes called a *'reductio ad absurdam'*—a reduction to absurdity. It is a standard tool of logical proof. If it can be shown that assuming a proposition P leads to a contradiction, it follows that P must be false. If the statement in premise 4 really is a contradiction, then it is not inappropriate to conclude that the supposition in premise 2 must be false.

> **Premise 6** (A preliminary conclusion from steps 1 and 5): Since the GCB does "exist in our minds" (step 1) and it cannot exist only in the mind and not in reality (step 5), the GCB must exist in reality.

Once again, this premise employs a standard inference rule. If we are forced by logic to conclude that the claim "The GCB exists only in the mind and not in reality" is false (since it leads to contradiction), then we must conclude that either the GCB doesn't exist either in the mind or in reality, or we must conclude that the GCB exists in reality and in the mind. There are no other logical alternatives. But in accepting premise 1, we accepted the claim that the GCB exists in the mind. If the other premises are sound, it does indeed seem to follow that the GCB must exist in reality as well as in the mind.

> **Conclusion:** God exists in reality.

The conclusion as stated is obviously implicit in premise 6 and the definition of God as the GCB. If premise 6 is true, then it must be true that God exists in reality.

The weakest step we have identified here is premise 3. In examining the argument further, you might focus on this premise and see whether you can persuasively demonstrate that it is false. But it will also be important to consider how Anselm might respond to the objection we have raised.

STEP 4, Re-evaluation of the Argument:

Anselm seems to have assumed that things are "greater" when they exist in the understanding and in reality, and less good when they exist only in the understanding. We raised questions about this assumption: some fictional things, we argued, would be worse if they existed in reality than they would be if

they existed only in the imagination—only in the 'mind.' How would Anselm respond?

Anselm might respond that the argument does not assume that things are better when they exist than when they don't exist—this is only true of things that are Good: it may be true that bad things (like the Mad Scientist) are better when they are only imaginary. But if things are good, then it is better when they're real. Consider, for example, whether imaginary brownies can ever be as good as the real thing. The argument assumes that the GCB is a good thing—the assumption is implicit in Anselm's conception of God as the 'greatest conceivable being.'

In fact, as you read further you will find that Anselm makes a point something like this later in the Proslogion: he argues that the logic of his argument works only for 'that than which nothing greater can be thought,' and not for any other thing. Is his argument persuasive? You will need to evaluate it for yourself.

Taking Things Further…

Obviously the philosophical project is not finished: there is much more to say about Anselm's argument, and philosophers are still divided about whether it succeeds or fails. When philosophical arguments are brilliant and interesting like this one, they can generate centuries of discussion, as Anselm's argument has in fact done. It is unlikely that you will resolve such arguments in your first philosophy course, but you can certainly get an appreciation for them by reading carefully and critically, and by raising skeptical objections as you go. Reading philosophy cannot be a passive experience.
