Read the letter from Stephen Hawking (see below) and Underwood Dudley's article "What Is Mathematics For?" (linked on webpage).

For part (a) of your reading assignment, please include answers to the following questions.

Don't forget to include parts (b) and (c) (as described in the syllabus) on what you turn in.

1. Why do you think mathematics is important for people in general to study?
2. Why do *you* study mathematics?
3. What commonalities did you see between these two pieces and the books we've read so far?
4. What differences did you see?
5. How do the views expressed in these two pieces relate to any of your experience learning math?
6. How do the views expressed in these three pieces interact with some of the big players in the historical development of mathematics that we've read about over the last few weeks? (Imagine a conversation/letters between one of the authors and a few historical figures.)
7. What things struck you in either of these two pieces?

In October 2005, *Discover* magazine printed the following from Stephen Hawking, in which he responds to someone asking if physicists will be able to find a single, unifying theory of the universe. As you may know, Stephen Hawking was Lucasian professor of mathematics, a position once held by Issac Newton, and was the author of, among many other things, the book *A Brief History of Time*.

> Up to now, most people have implicitly assumed that there is an ultimate theory that we will eventually discover. Indeed, in the past I myself have suggested we might find it quite soon. However, we have recently realized that the two leading candidates for the ultimate theory—supergravity and string theory—are just part of a larger structure known as M-theory. Despite its name, M-theory isn't a single theory. It is actually a network of theories, each of which works well in certain circumstances but breaks down in others. These theories have quite different properties. For instance, in some theories space has 9 dimensions while in others it has 10. Yet all these theories are on a similar footing—none can be said to be a better representation of the real world than the others. This has now made me wonder whether it is possible to formulate a single theory of the universe, at least in a finite number of statements.
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> There are other, purely theoretical, reasons to believe that an ultimate theory of everything might not be possible. For instance, there is Gödel's theorem, which says that you cannot formulate a finite system of axioms to prove every result in mathematics. A physical theory is a mathematical model, so if there are mathematical results that cannot be proved, there are physical problems that cannot be solved. But the real relevance of Gödel's theorem is its connection to the fact that inconsistencies can arise if you try to prove statements that refer to themselves. One of the most famous of these is the assertion "This statement is false." If the statement is true, then according to the statement itself, the statement is false. But if the statement is false, then the statement must be true. Since we are not angels who view the universe from the outside, we—and our theories—are both part of the universe we are describing, and hence our theories are also self-referencing. And so one might expect that they, too, are either inconsistent or incomplete.

Some people will be very disappointed if there is no ultimate theory that can be formulated as a finite number of principles. I used to belong to that camp, but I've changed my mind. I'm now glad that our search for understanding will never come to an end, and that we will always have the challenge of new discovery.

And a comic to go with Dudley's article: