Projective Spaces

Real and complex projective spaces are fundamentally important objects in several branches of mathematics, including algebraic topology, geometric topology, Riemannian geometry and algebraic geometry. Although these spaces are often defined very quickly and directly, such definitions give little if any insight into the reasons why such objects arose and why they continue to be studied. The following online references provide some information about these points (mainly the first, but also a little about the second).

http://math.ucr.edu/~res/math133/geometrynotes4a.pdf

http://math.ucr.edu/~res/math133/geometrynotes4b.pdf

http://math.ucr.edu/~res/progeom/

http://vision.stanford.edu/~birch/projective/

http://www.youtube.com/watch?v=fX7IOxuljKY

(This is a video, and it contains links to further videos in the same series.)

http://www.britannica.com/EBchecked/topic/478486/projective-geometry

Since the *Wikipedia* article on the subject is accurate and well-written, it is also recommended:

http://en.wikipedia.org/wiki/Projective_geometry

Some general comments on *Wikipedia* and other Internet references appear on the next page. All of the displayed links meet the criteria in the comments.

Traditional printed publications in mathematics are normally filtered through an editorial reviewing process which checks their accuracy (not perfectly, but for the most part very reliably). Some widely used Internet sources maintain similar standards (for example, most of the sites supported by recognized academic institutions), but others have far more lenient standards, and this fact must be acknowledged. Probably the most important single example is the widely used *Wikipedia* site:

http://en.wikipedia.org/wiki/Main_Page

The *Wikipedia* site contains an incredibly large number of articles, with extensive information on a breathtakingly vast array of subjects. The articles are written by volunteers, and in most cases they can be edited by anyone with access to the Internet, including some individuals whose views or understanding of a subject may be highly controversial or simply unreliable. This issue has been noted explicitly by *Wikipedia* in its articles on itself, and in particular the following discuss the matter in some detail.

http://en.wikipedia.org/wiki/Wikipedia

http://en.wikipedia.org/wiki/Reliability_of_Wikipedia

Since these notes make numerous references to *Wikipedia* articles, the underlying policies and reasons for doing so deserve to be discussed. First of all, despite the justifiable controversy surrounding the reliability of some online *Wikipedia* articles, the entries for standard, well – established topics in the sciences are generally very reliable, and the ones cited here were specifically checked for accuracy before they were cited. As such, they are inserted in this document as convenient but reliable online alternatives to more traditional library references strictly on a case by case basis. In particular, the citations here should not be interpreted as a blanket policy of acceptance for all such articles, even in the sciences. Generally speaking, it is best to think of *Wikipedia* articles as merely first steps in gathering information about a subject and not as substitutes or replacements for more authoritative (printed or electronic) references in term papers or scholarly articles. **ALL** statements in *Wikipedia* articles definitely should be checked independently using more authoritative sources, especially when writing papers for class assignments or formal publication.

In any discussion of Internet references, some comments about World Wide Web searches using *Google* (or other search engines) are also appropriate. The extreme popularity and wide use of *Google* searches clearly show their value for all sorts of purposes. Of course, it is important to remember that search engines are designed to make money and that profit motives (or other considerations) might affect the results of searches and the order in which sources are listed, but usually this is currently not a problem for topics in history or the sciences. Most of the time search engines are extremely reliable at listing the best references first, but this is not always the case, and therefore it is recommended that a user should normally go beyond the first page of 10 search results. As a rule, it is preferable to look at the top $20, 50$ or even 100 results.