As the title indicates, this article deals with the problem of Gribov ambiguity in quantum Yang-Mills theory. Most of the materials covered in the article are, however, elementary and may be found in standard textbooks on quantum field theory. The reason would be that the author is a graduate student who is about to embark on a serious research project. It is a good undertaking by the author with a lot of pedagogical descriptions on the subject. In this sense, this article may be useful for mathematicians (or undergraduate physics students) who are not yet familiar with gauge theories. Owing to such a character of this article, original results are limited and condensed towards the end, in the latter part of section 5 and in section 6. The author claims that the Gribov ambiguity requires modification of gluon propagators in the infrared region and argues that it is consistent with the existence of the mass gap in non-abelian gauge theories. Similar modifications in curved spaces are also considered in section 6.