1096-G1-2359 **Horia I. Petrache*** (hpetrach@iupui.edu), 402 N. Blackford St., LD154, Physics, IUPUI, Indianapolis, IN 46202. *A group theory perspective of mathematical constructs in physics.* Preliminary report.

In physics, mathematical constructs such as Fourier transforms and complex numbers are regarded as useful tools: they are used because they work as needed to model physical systems and their behavior. But are these tools unique or even necessary? Can we do physics without Fourier transforms, or without trigonometric functions? To answer this odd question, one would need to try to reconstruct physics without these mathematical ingredients, a very impractical task to say the least. One could also reason that if these mathematical ingredients were not necessary, physics would have likely eliminated them already! It is suggested here that a more unified "rediscovery" of mathematical constructs can be useful to address the question of their uniqueness and necessity in physics. An example is provided based on an investigation of the differential operator within group theory at elementary level. The framework of group theory is appropriate at this point in time because physics theories fundamentally are group theories. By doing this, we do not discover new mathematical constructs or new properties. Rather, the purpose of this exercise is to see how a number of mathematical constructs appear as consequences of fundamental physics principles. (Received September 17, 2013)