Footnote to http://math.ucr.edu/~res/math133/examples0101.pdf**:**

Strictly speaking, one needs to prove that the vector **c** lies in the interior of $\angle \mathbf{a0b}$, but one obstacle to doing so is that the interior of an angle is not defined in Unit **I.** However, this follows directly from Proposition **II.3.3** (see page **61** of the notes) because **c** is a linear combination of **a** and **b** in which both coefficients are positive by construction (of course, we can also retrieve the barycentric coordinate of **0** because the sum of the barycentric coordinates is always equal to **1**).