1067-83-1984   **Amir Babak Aazami*** (`aazami@math.duke.edu`), Department of Mathematics, Duke University, Durham, NC 27708. *Orbifolds, the A, D, E Family of Caustic Singularities, and Gravitational Lensing.*

We provide a geometric explanation for the existence of magnification relations for the A $(n \geq 2), D$ $(n \geq 4), E_6, E_7, E_8$ family of caustic singularities, which were established in recent work. In particular, it was shown that for families of general mappings between planes exhibiting any of these caustic singularities, and for any non-caustic target point, the total signed magnification of the corresponding pre-images vanishes. As an application to gravitational lensing, it was also shown that, independent of the choice of a lens model, the total signed magnification vanishes for a light source anywhere in the four-image region close to elliptic and hyperbolic umbilic caustics. This is a more global and higher-order analog of the well-known fold and cusp magnification relations. We now extend each of these mappings to weighted projective space, which is a compact orbifold, and show that magnification relations translate into a statement about the behavior of these extended mappings at infinity. This generalizes multi-dimensional residue techniques developed in previous work, and introduces weighted projective space as a new tool in the theory of caustic singularities and gravitational lensing. (Received September 22, 2010)