Volume Between a Double Cone and a Sphere

This is a problem related to one that appears in Math 126 section 15.3, but could also be done using Math 125 method. The original question was to find the volume between above cone $z = \sqrt{x^2 + y^2}$ and inside the sphere $x^2 + y^2 + z^2 = r^2$.

For this gallery entry, we decide to add to our collection of examples where we dissect the sphere into two solids of equal volume. Here we use the double done $z = \pm\ m\sqrt{x^2 + y^2}$ and we found the value of m so that the volume of the remaining part of the sphere is exactly half the volume of the sphere. Can you find the value of m that makes this work?