1. Change the order of integration of the double integral \( \int_0^1 \int_{\frac{y^{1/3}}{y}} x^2 \, dx \, dy \).

**Solution:** We note that the area, if we were to sketch it, would be the region in the first quadrant bounded on the left by the line \( x = y \) and on the right by the curve \( x = y^{1/3} \). We note that \( x = y^{1/3} \) is equivalent to \( y = x^3 \). To summarize how integration is being perceived currently, we are looking, in terms of left and right, at what functions in terms of \( y \) that our \( x \) values fall between and then looking at what constants \( y \) falls between. To reverse the order of integration, we do the opposite: we look, in terms of up and down, at what functions in terms of \( x \) that \( y \) falls between and then what constants \( x \) falls between. Thus we come up with the new limits of integration that \( 0 \leq x \leq 1 \) and \( x^3 \leq y \leq x \). And so we can rewrite the integral as \( \int_0^1 \int_{x^3}^x x^2 \, dy \, dx \) which can then be evaluated.