1. (6 points) Let $R$ be the finite region bounded by the graphs of $x = 2y^2$ and $x = 10y$. Set up, but do not evaluate, definite integrals which represent the volumes of the following solids.

(a) The volume of the solid formed when $R$ is revolved around the vertical line $x = 60$. Determine this volume in the following two ways.

i. Integrate with respect to $x$.

ii. Integrate with respect to $y$. (Use different integrands in parts $i$ and $ii.$)
(b) The volume of the solid with base \( \mathbb{R} \) for which the cross-sections perpendicular to the \( y \)-axis are semi-circles.

2. (4 points) Find the average value of the function \( f(x) = \frac{24x}{x^2 + 1} \) on the interval \([1, 7]\).