1. (3 points) Find the volume of the solid beneath the paraboloid \( f(x, y) = 12 - x^2 - 2y^2 \) and above the region \( R = \{(x, y) : 1 \leq x \leq 2, 0 \leq y \leq 1\} \).
2. (4 points) In the $xy$-plane, the region $R$ is bounded by $y = \sqrt{x}$, $x = 4$ and the $x$-axis. Determine the volume of the solid bounded above by $f(x, y) = \frac{y}{1 + x^2}$ and below by the region $R$.

3. (3 points) Calculate $\int_0^1 \int_1^2 \frac{xe^y}{2y} \, dy \, dx$