

Evaluate

1. $\int_{\mathcal{R}} \int xy^2 dA$ where \mathcal{R} is bounded by the curves $y = x^2$ and $y = 5x + 6$.

2. $\int_{\mathcal{R}} \int \frac{\ln y}{x^2} dA$ where $\mathcal{R} = \{(x, y) : 1 \leq y \leq 2, y \leq x \leq 2y\}$

$$3. \int_0^1 \int_{y^{2/3}}^1 ye^{x^4} dx dy$$