

**Solution:**

Let  $P(x, y) = xy^2$  and  $Q(x, y) = 4x^2y$ . By Green's Theorem

$$\begin{aligned}\oint_C xy^2 dx + 4x^2y dy &= \iint_D \left( \frac{\partial Q}{\partial x} - \frac{\partial P}{\partial y} \right) dA \\ &= \int_0^2 \int_x^{2x} (8xy - 2xy) dy dx \\ &= \int_0^2 \int_x^{2x} 6xy dy dx \\ &= \int_0^2 3xy^2 \Big|_x^{2x} dx \\ &= \int_0^2 9x^3 dx \\ &= \frac{9}{4} x^4 \Big|_0^2 \\ &= 36.\end{aligned}$$

