1. Evaluate the iterated integral $\int_0^2 \int_1^3 x^3 y^2 \, dy \, dx$.

▶ **Solution.**

$$\int_0^2 \int_1^3 x^3 y^2 \, dy \, dx = \int_0^2 \frac{x^3 y^3}{3} \bigg|_{y=1}^{y=3} dx = \int_0^2 \left(9x^3 - \frac{x^3}{3}\right) = \int_0^2 \frac{26}{3} x^3 \, dx$$
$$= \frac{26}{12} x^4 \bigg|_0^2 = \boxed{\frac{104}{3}}.$$

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2. Evaluate the iterated integral $\int_0^1 \int_0^{y^3} e^{x/y} \, dx \, dy$.

▶ **Solution.**

$$\int_0^1 \int_0^{y^3} e^{x/y} \, dx \, dy = \int_0^1 y e^{x/y} \Big|_{x=0}^{x=y^3} dy = \int_0^1 \left(y e^{y^2} - y\right) dy$$
$$= \left(\frac{1}{2} e^{y^2} - \frac{y^2}{2}\right) \bigg|_0^1 = \frac{1}{2} e - \frac{1}{2} - \frac{1}{2} = \boxed{\frac{1}{2} e - 1}.$$

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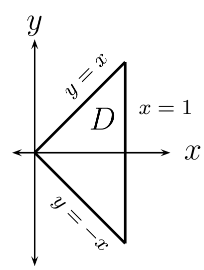
3. Consider the double integral
$$\iint_D (x^2 + 4y^3) \, dA,$$
where D is the triangular region bounded by the lines $x = 1$, $y = x$, and $y = -x$.

(a) Sketch the region D.



(b) Express I as an iterated integral and evaluate it.

▶ **Solution.**

$$I = \int_0^1 \int_{-x}^{x} (x^2 + 4y^3) \, dy \, dx = \int_0^1 (x^2 y + y^4) \Big|_{y=-x}^{y=x} dx$$
$$= \int_0^1 2x^3 \, dx = \frac{1}{2} x^4 \bigg|_0^1 = \boxed{\frac{1}{2}}.$$

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