

1. a)

$$\iint_{[0,1] \times [2,4]} (x^2 y + xy^3 - 2) d(x, y) = \int_2^4 \left( \int_0^1 x^2 y + xy^3 - 2 dx \right) dy = 28$$

b)

$$\iint_{[\pi/2, \pi] \times [-\pi/4, \pi/4]} \sin(x/y) d(x, y) = 0$$

c)

$$\iint_{[0, \pi/2] \times [0, 2]} x \sin(xy) d(x, y) = \int_0^{\pi/2} \left( \int_0^2 x \sin(xy) dy \right) dx = \pi/2$$

2.  $x_s = 0$  und  $y_s = 4/(3\pi)$

3. a)

$$\int_{M_1} \frac{d(x, y)}{x^2 + y^2} = \int_1^3 \int_0^{2\pi} \frac{d\phi dr}{r} = 2\pi \ln 3$$

b)

$$\int_{M_2} x^2 d(x, y) = \int_0^{2\pi} \int_0^4 r^3 \cos^2 \phi d\phi dr = 64\pi$$

4.

$$\text{Fläche} = \int_0^{2\pi} \int_0^{\phi^2} r dr d\phi = (2\pi)^5/10$$