

MAT 91121-22 Opgave E31

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Vi skal udregne planintegralet

$$\iint_S 2xy^2 dA$$

når $S = \{(x, y) \mid x \geq y^2 \wedge x^2 + y^4 \leq 2\}$. Vi finder, idet skæringspunkterne mellem kurverne $x - y^2 = 0$ og $x^2 + y^4 = 2$ er $(1, \pm 1)$, at

$$\begin{aligned} \iint_S 2xy^2 dA &= \int_{-1}^1 dy \int_{y^2}^{\sqrt{2-y^4}} 2xy^2 dx \\ &= \int_{-1}^1 [x^2 y^2]_{y^2}^{\sqrt{2-y^4}} dy = \int_{-1}^1 ((2 - y^4) y^2 - y^6) dy \\ &= \int_{-1}^1 (2y^2 - 2y^6) dy = \frac{16}{21} \end{aligned}$$