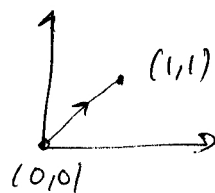


Exercises 6

1. $I = \int (3x dx + x y^2 dy)$

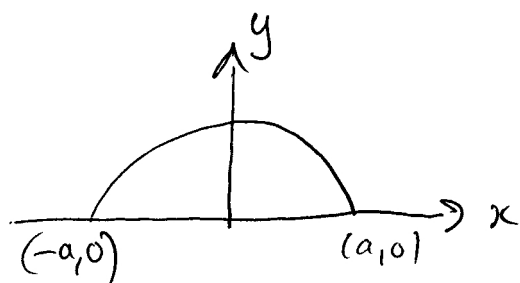


Parameterise, choose x as parameter, $\frac{dy}{dx} = 1$ along the path, $y = x$

$$I = \int_0^1 (3x + x^3 dx)$$

$$= \left[\frac{3x^2}{2} + \frac{x^4}{4} \right]_0^1 = \frac{3}{2} - \frac{1}{4} = \underline{\underline{\frac{5}{4}}}$$

2.



$$m(x,y) = cy$$

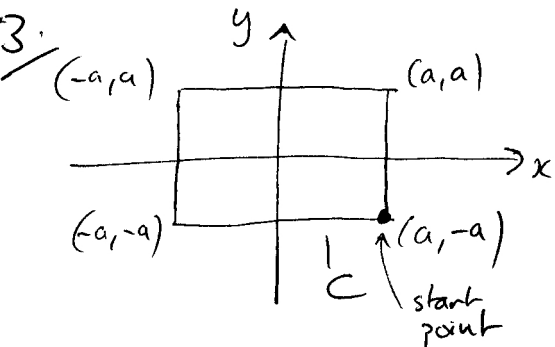
$$M = \int m ds$$

Parameterise: use polar coordinates, $ds = \rho d\theta$

$$M = \int_0^\pi c(\rho \sin \theta) \rho d\theta \quad \text{where } \rho = a$$

$$= ca^2 [-\cos \theta]_0^\pi$$

$$= ca^2 [-1 - 1] = \underline{\underline{2ca^2}}$$



$$\oint (x dy - y dx)$$

$$= \int_{-a}^a a dy - \int_a^{-a} a dx + \int_a^{-a} (-a) dy - \int_{-a}^a (-a) dx$$

$$= 2a \int_{-a}^a dx + 2a \int_{-a}^a dy$$

$$= \underline{\underline{8a^2}}$$