

MA1012: Problem Sheet 4

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April 2023

1. A rectangular box without a lid is to be made from 9 m^2 of cardboard. Find the maximum volume of such a box.
2. Find three real numbers such that the sum of the numbers is 10 and the sum of their squares is as small as possible.
3. Evaluate $\iint_Q \cos x^3 dx dy$, where Q is the region in \mathbb{R}^2 bounded by $y = 3x^2$, $y = 0$ and $x = 1$; and where $Q = \{(x, y) \in \mathbb{R}^2 : x^2 + y^2 \leq 1, x \geq 0, y \geq 0\}$.
4. Find the volume of the solid enclosed by the surfaces $z = 6 - x^2 - y^2$, $z = 2x^2 + y^2 - 1$, $x = -1$, $x = 1$, $y + 1 = 0$ and $y = 1$.