MA231 Vector Analysis
Example Sheet 1

Students should hand in solutions to questions B1, B2, B3 and B4 by 3pm Monday of week 4 to the maths pigeonloft. Maths students hand in solutions to their supervisors and maths/physics students hand solutions into the slots marked *Vector Analysis Maths+Physics*.

Corrected version of questions B4 (c):

B4 **Line integrals**

(a) Evaluate the line integral

$$\int_{\mathcal{C}} (x + y^2),$$

where $\mathcal{C}$ is the parabola $y = x^2$ in the plane $z = 0$ connecting the points $(0,0,0)$ and $(2,4,0)$.

(b) Calculate the tangent line integral of the vector field

$$v(x,y,z) = \big((x-1)(z-3), xyz, x+z\big)$$

along the straight line from $(1,1,1)$ to $(1,3,9)$.

(c) Consider the half circle $\mathcal{C} = \big\{y^2 + z^2 = 1, z \geq 0, x = 0\big\} \subseteq \mathbb{R}^3$ and the vector field $f(x,y,z) = (0,y,0)$. Use the fundamental theorem of calculus for gradient vector fields to calculate the tangent line integral of f along $\mathcal{C}$ from $(0,-1,0)$ to $(0,1,0)$.