

HOMEWORK 7: DUE 24 FEBRUARY

- (1) (Problem 36 in §17.1) Compute the flux of the vector field $F(x, y) = (x^2, y^2)$ across the boundary of the triangle with vertices $(0, 0)$, $(1, 0)$, $(0, 1)$.
- (2) (Problem 3 §16.4) The function $G(u, v) = (2u+1, u-v, 3u+v)$ parametrizes the plane $2x - y - z = 2$.
- (a) Calculate \mathbf{T}_u , \mathbf{T}_v , and $\mathbf{N}(u, v)$.
 - (b) Find the area of $G(\mathcal{D})$ where

$$\mathcal{D} = [0, 2] \times [0, 1]$$

in the (u, v) plane.

- (3) (Problem 5 §16.4) Let $G(u, v) = (u, v, uv)$.
- (a) Calculate \mathbf{T}_u , \mathbf{T}_v , and $\mathbf{N}(u, v)$.
 - (b) Let S be the part of the surface with parameter domain

$$\mathcal{D} = \{(u, v) : u^2 + v^2 \leq 1, u \geq 0, v \geq 0\}.$$

Verify the following formula and evaluate using polar coordinates:

$$\iint_S 1 \, dS = \iint_{\mathcal{D}} \sqrt{1 + u^2 + v^2} \, du \, dv.$$