

Math 13 Homework #4
Due Wednesday, April 24th

- (1) Find a linear mapping G that maps $[0, 1] \times [0, 1]$ to the parallelogram in the xy -plane spanned by the vectors $\langle -2, 5 \rangle$ and $\langle 1, 7 \rangle$.
- (2) Let $G(u, v) = (u + v, u - v)$.
- (a) What is the slope of the line given by the image of the line $v = mu + b$ under the map G for $m = 0$? $m = 2$?
 - (b) For what value of m is the image of the line $v = mu + b$ a vertical line? A horizontal line?
 - (c) Compute the Jacobian of G .
- (3) Let \mathcal{D} be the image of $\mathcal{R} = [1, 4] \times [1, 4]$ under the map $G(u, v) = (u^2/v, v^2/u)$.
- (a) Compute the Jacobian of G .
 - (b) Sketch \mathcal{D} .
 - (c) Use the Change of Variables formula to compute $\text{Area}(\mathcal{D})$ and

$$\iint_{\mathcal{D}} (x + y) \, dx dy.$$

- (4) Calculate the integral of $f(x, y) = e^{3x-2y}$ over the parallelogram with vertices $(0, 0)$, $(1, 3)$, $(5, 1)$ and $(6, 4)$.