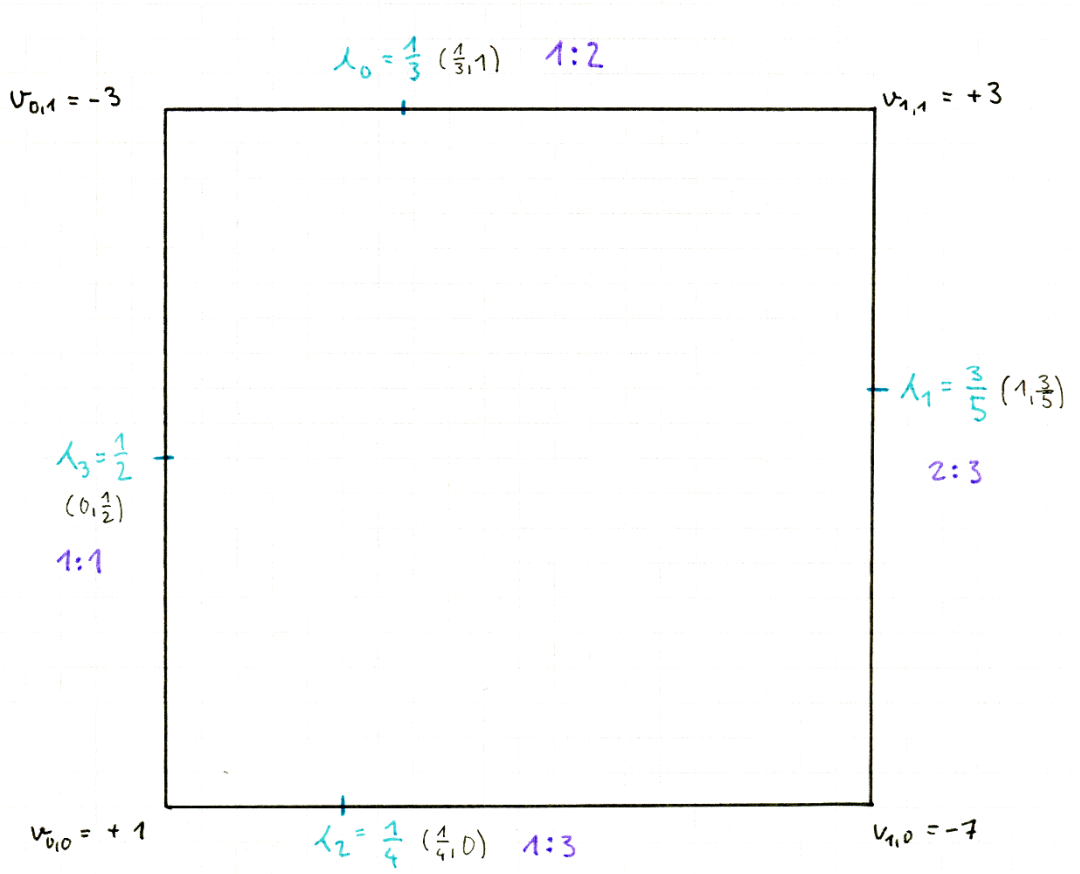
Data Visualization – Course Work

Assignment 5

Task 3: Compute Marching Squares by hand

Mark the locations where the isolines should intersect the edges. Remember that the values $v_{i,j}$' are interpolated linearly. Draw as exact as possible.



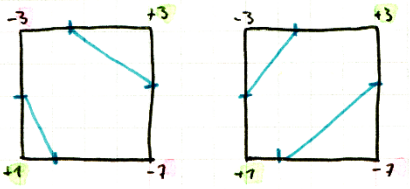
$\lambda \in [0,1]$ $\lambda = \frac{f - f_0}{f_1 - f_0}$

$\lambda_0 = \frac{(-1)-(-3)}{(+3)-(-3)} = \frac{2}{6} = \frac{1}{3}$ $\lambda_2 = \frac{(-1)-(+1)}{(-7)-(+1)} = \frac{2}{8} = \frac{1}{4}$

$\lambda_1 = \frac{(-1)-(-7)}{(+3)-(-7)} = \frac{6}{10} = \frac{3}{5}$ $\lambda_3 = \frac{(-1)-(+1)}{(-3)-(+1)} = \frac{2}{4} = \frac{1}{2}$

The next step is to connect the intersection points on the edges to create the isoline segments for this cell. You will discover an ambiguity that should be resolved explicitly by calculating the asymptotes.

Ambiguity:



Hyperbolae: $f(x) = a + \frac{c}{x-b}$

a: asymptote $a = y$

b: asymptote $b = x$

c: compression

$f_0(x) = 1 = a + \frac{c}{(\frac{1}{3}-b)}$

$f_1(x) = \frac{3}{5} = a + \frac{c}{(1-b)}$

$f_2(x) = 0 = a + \frac{c}{(\frac{1}{4}-b)}$

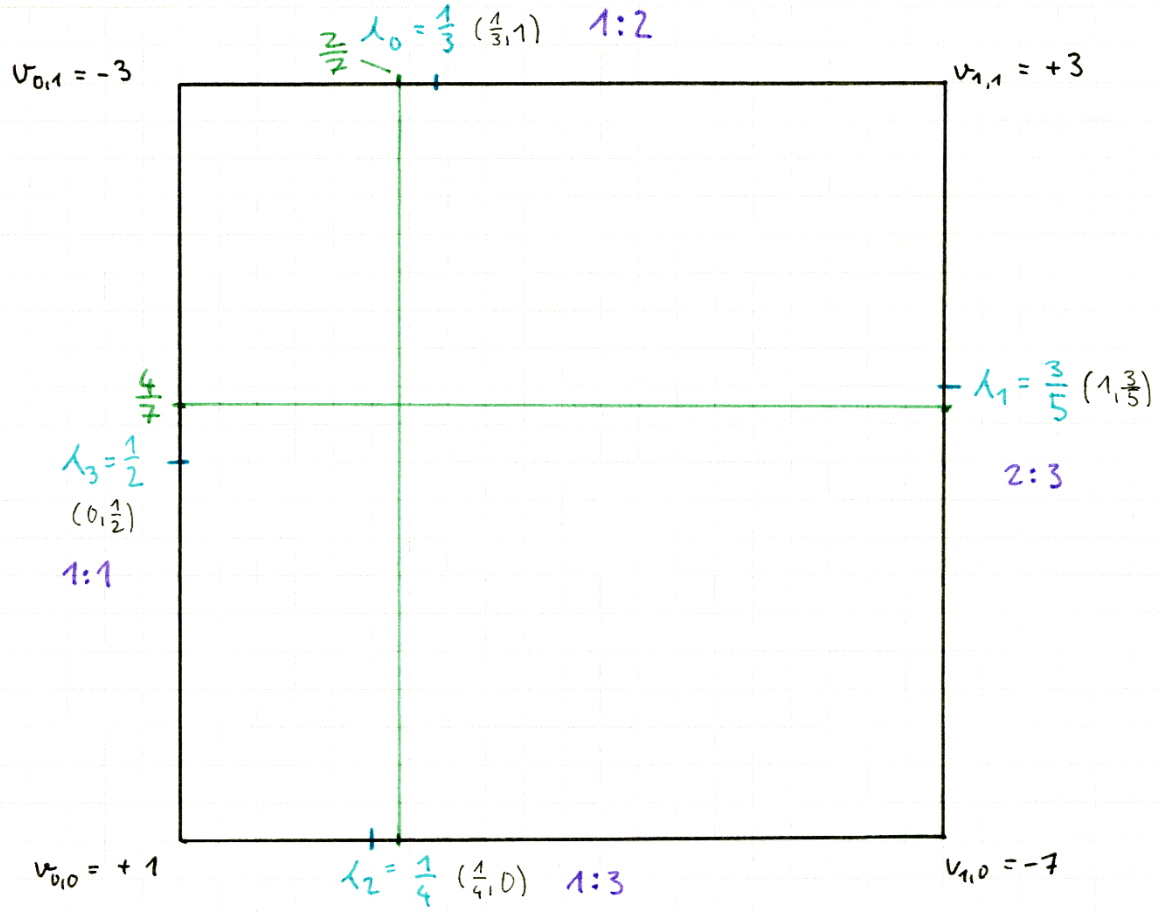
$f_3(x) = \frac{1}{2} = a + \frac{c}{(-b)}$

set $f_0(x) = f_1(x) = f_2(x)$

OR

$f_0(x) = f_1(x) = f_3(x)$ ...

$\Downarrow$ $a = \frac{4}{7}$ $b = \frac{2}{7}$ $c = \frac{1}{49}$



Finally draw the isoline segments for $v = -1$.