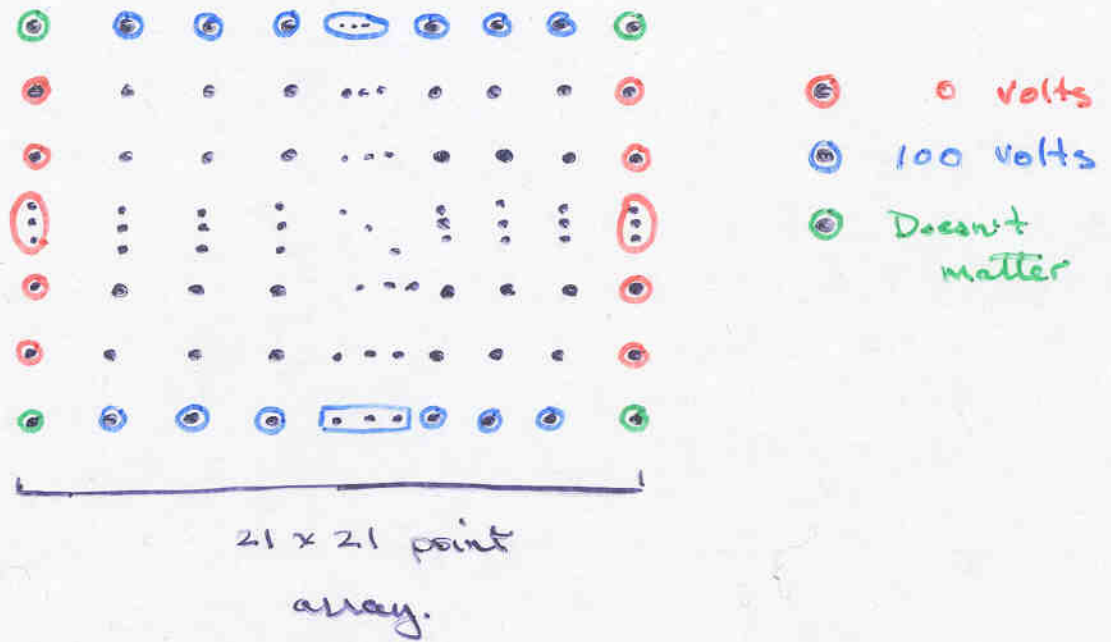
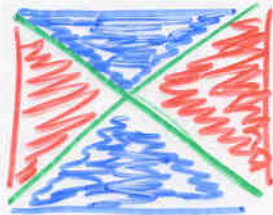


Finite Elements Mathematica Example.

The Problem:



Expectations:



— 50 volts
 < 50 volts
 > 50 volts

Theory:

Conformal mapping with Schwarz-Christoffel transform:

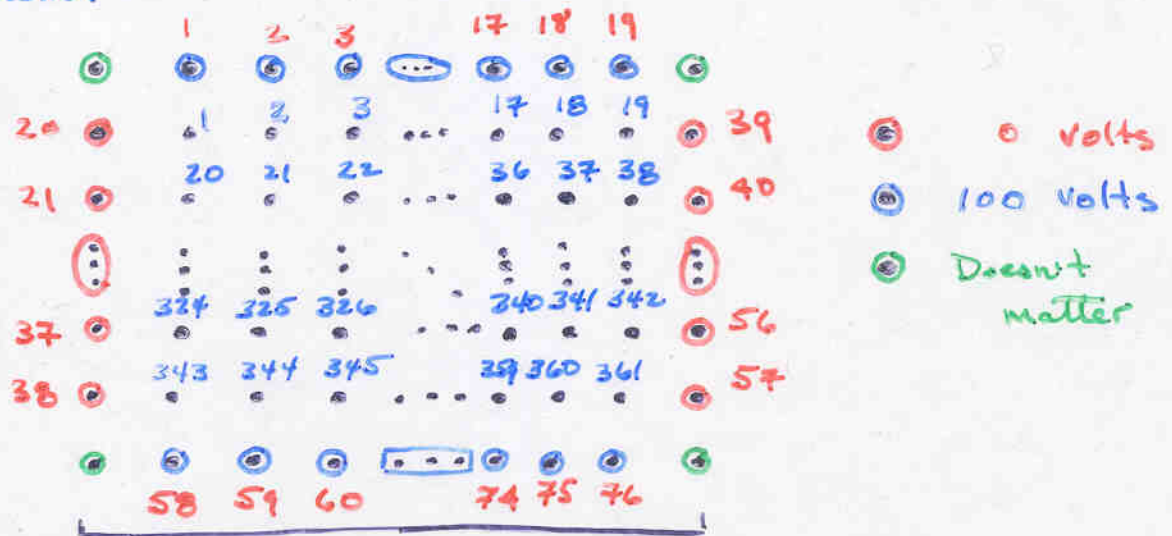
$$z(\omega) = \text{Jacobi SN} \left[\frac{\omega}{C_1}, \frac{1}{\mu^2} \right]$$

$$V(z) = \text{Log}(z+1) - \text{Log}(z-1) - \text{Log}(z+\mu) + \text{Log}(z-\mu)$$

$$\phi(x,y) = 100 * \text{Im}(V(z(x+iy)))$$

Finite Elements Mathematica Example.

The Problem:



Red points V_i

Blue points ϕ_i

Matrix Inversion:

$$[\phi] = [A][\phi] + [B][V]$$

$$\phi_1 = \frac{1}{4} (\phi_2 + \phi_{20} + V_2 + V_{20})$$

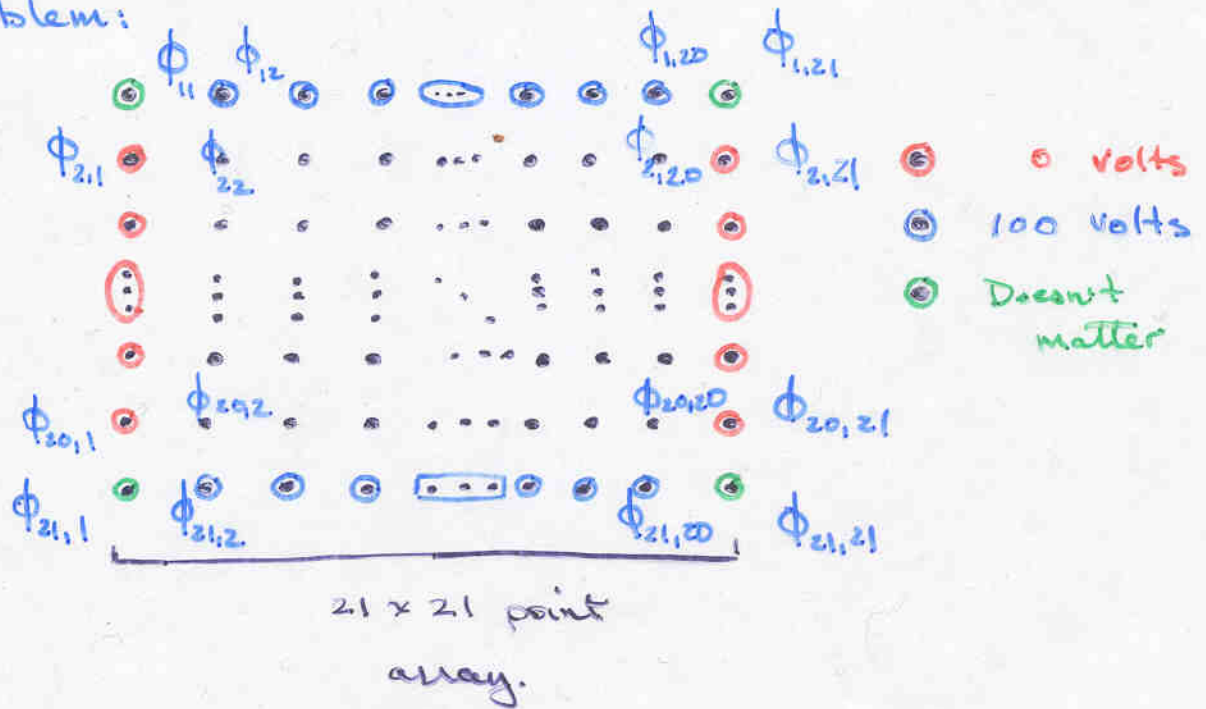
$$\phi_{21} = \frac{1}{4} (\phi_2 + \phi_{20} + \phi_{40} + \phi_{22})$$

$$[\phi] = [I - A]^{-1} [B][V]$$

Finite Elements

Mathematica Example.

The Problem:



Re-Iteration

relax \rightarrow
$$\phi_{i,j}^{n+1} = \frac{1}{4} (\phi_{i-1,j}^n + \phi_{i+1,j}^n + \phi_{i,j-1}^n + \phi_{i,j+1}^n)$$

Boundary points do not change.

[fixed matrix = 0 for boundary;
= 1 for interior]

- Example
- 1 $\phi_{\text{interior}} = 0$
 - 2 $\phi_{\text{interior}} = 50$ (Better initial guess)
 - 3 $\phi_{\text{interior}} = \text{theory}$ (finite element error)
 - 4 $\phi_{\text{interior}} = \text{matrix inversion}$
 - 5 large grid \rightarrow small grid
(better initial guesses)
 - 6 geometric series approximation.