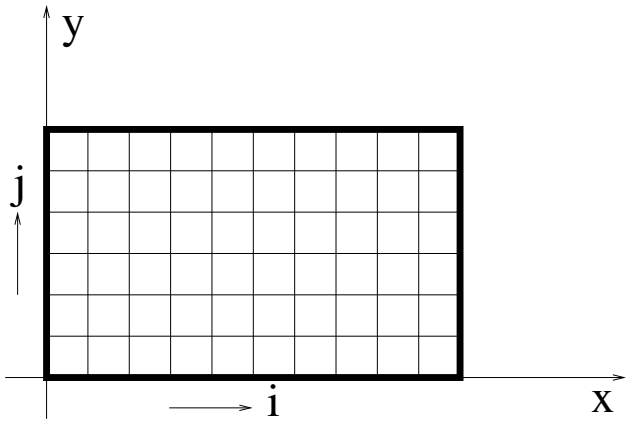
15.4: Interpretation of $M = \iint_R \delta(x, y)\ \mathrm{d}A$



- Divide a large rectangular plate into small subregions with area ΔA
  - Small enough so that density $\delta_{ij}(x, y)$ is approximately constant
  - The mass of subregion (i, j) is $M_{ij} = \delta_{ij}\Delta A$
- Mass M of the whole plate is the sum of all masses M_{ij}
  - $M = \sum_{i=1}^{m-1} \sum_{j=m}^{n-1} M_{ij} = \sum_{i=1}^{m-1} \sum_{j=1}^{n-1} \delta_{ij}\Delta A$
  - When $m, n \to \infty$ we get the limit definition of a double integral

$$M = \lim_{m\to\infty} \lim_{n\to\infty} \sum_{i=0}^{m-1} \sum_{j=0}^{n-1} \delta_{ij}\Delta A_{ij} = \iint_R \delta(x, y)\ \mathrm{d}A$$