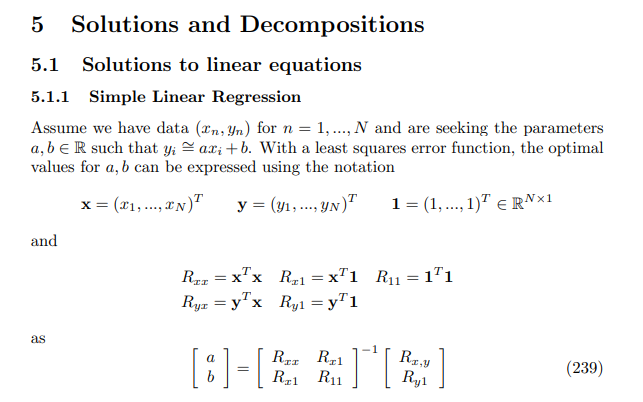
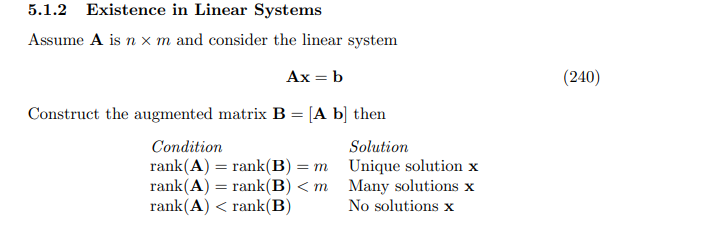
Linear Equation

Existence

There are three cases of linear equations (with no other restrictions)

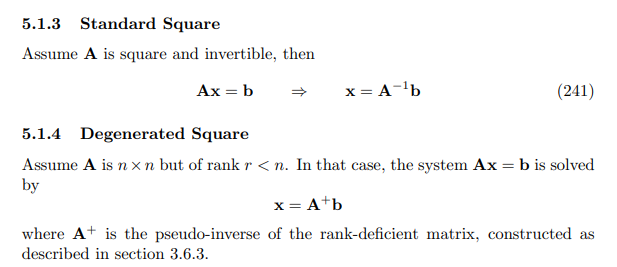
|  |  |  |
| --- | --- | --- |
|  | unique | can be reduced to row-echolen format. |
|  | many | can NOT. And there are at least 1 row containing all 0 and its corresponding value is zero. |
|  | No solution that satisfies requirements | can NOT, but the corresponding value is NOT zero. |





When the linear equations has unique solution , will be the inverse or psuedo-inverse of over . Exactly say,

|  |  |
| --- | --- |
|  | Invertible and square. |
|  | Invertible and not square. |
| No solution | Non-invertible. |



Determined rectangular matrix

Way to find

Cramer’s rule

When there are exactly one solution and is invertible and square. Then one can applied to Cramer’s rule.

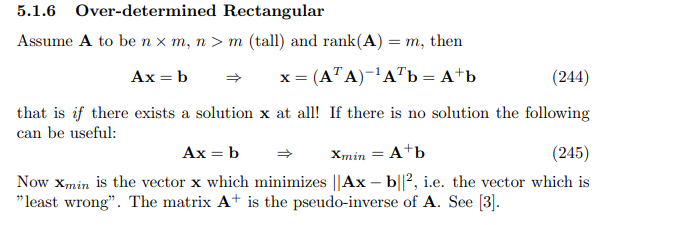
where

= , if

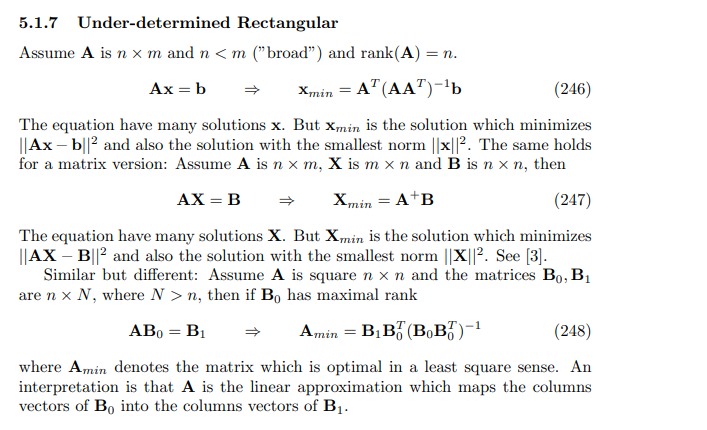
, otherwise

That is, is almost equal to , but the ith column of is substitute by .

Over-Determined rectangular matrix



Under-determined rectangular matrix



Special case

When is any vector.

|  |  |
| --- | --- |
|  |  |
|  |  |

where

refers zero matrix

Ref

[Wayback Machine (archive.org)](https://web.archive.org/web/20090521075124/http://www2.imm.dtu.dk/pubdb/views/edoc_download.php/3274/pdf/imm3274.pdf)