CoCoALib - Slug #1187

Matrix rank is slow (over QQ)

19 Jun 2018 10:50 - John Abbott

Status:	New	**Start date:**	19 Jun 2018
Priority:	Normal	**Due date:**	
Assignee:		**% Done:**	0%
Category:	Improving	**Estimated time:**	0.00 hour
Target version:	CoCoALib-1.0	**Spent time:**	0.45 hour

Description

The rank function is too slow:

```
M := mat([[ random(-99,99) | j in 1..100] | i in 1..100]);
rk(M);        -- takes about 1s
det(M) <> 0; -- takes about 0.1s
```

Make it faster (at least for some cases).

History

#1 - 19 Jun 2018 10:56 - John Abbott

A potentially fast heuristic is to reduce mod p and compute the rank of the reduced matrix. This should be quick; if the reduced matrix has full rank then so did the original. The rank of the reduced matrix is <= true rank. A heuristic could try a few primes and then take the max of the ranks of the reduced matrices.

Maybe another heuristic for "long, thin" matrices would be to pick a "squarer" submatrix...

#2 - 26 Jun 2018 11:29 - John Abbott

Rank is slower than det even for matrices over a small finite field.
For example a random 500x500 matrix: det takes 0.06s, but rank takes about 1.2s.